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A Formative Experiment Approach

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PEDAGOGICAL REFLECTIONS ON A BLENDED LEARNING ENVIRONMENT IN GHANAIAN UNIVERSITIES: A FORMATIVE EXPERIMENT APPROACH

A Thesis Submitted for the Award of PhD in Information Technology

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Mandatory Title Page

THESIS TITLE: PEDAGOGICAL REFLECTIONS ON A BLENDED LEARNING ENVIRONMENT IN GHANAIAN UNIVERSITIES: A FORMATIVE EXPERIMENT APPROACH

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This thesis has been submitted for assessment in partial fulfilment of the PhD degree. The thesis is not based on the submitted or published scientific papers which are listed above. As part of the assessment, co-author statements have been made available to the assessment committee and are also available at the Faculty. The thesis is not in its present form acceptable for open publication but only in limited and closed circulation as copyright may not be ensured.

Abstract

In the course of two academic semesters, a blended learning environment intervention was introduced into a first year university Communication Skills (CS) classroom to improve the students' knowledge and skills in the course. The study was done using formative experiment (Reinking & Watkins, 2000) to test the students' and lecturers' perceptions and experiences of the implementation of a blended learning environment designed and named ABLECAT for the study. Quantitative and qualitative data were collected prior to the implementation of the intervention to establish a baseline performance of the students and again to determine their progress toward the pedagogical goal. Additionally, qualitative data comprising of focused interview, classroom observations, document analysis and informal conversational interviews with both the students and the lecturers were collected throughout the intervention. A local theory was developed about both the process of learning and the means designed to support the learning of CS through a designed *learning design sequence*. The key principle of using the *learning design sequence* was to design a representation of the learning activities and the support activities that were performed by the students and lecturers on ABLECAT in the CS course. This process led to the use of '*motivate, explore, apply* and *review/assess'* design of ABLECAT. The analysis of the findings showed wide acceptance of the use of the blended learning environment among students and lecturers. There was appreciable improvement of students' participation and interaction in the course which resulted in the improvement of the key areas of the Communication Skills course among the students. The lecturers were also able to interact with the students better than they used to with the face to face classroom setting.

Summary of Thesis: Danish

I to akademiske semestre blev der gennemført forsøg med et blandet studiemiljø (blended learning environment) hos førsteårsstuderende inden for et kommunikationsfag, Communication Skills, CS, for at forbedre de studerendes viden og færdigheder under kursusforløbet. Forskningsprojektet blev udført ved hjælp af et formativt eksperiment (Reinking & Watkins, 2000) for at teste de studerendes og undervisernes oplevelser af og erfaringer med implementeringen af et blandet studiemiljø, som blev designet til dette forskningsprojekt og kaldes ABLECAT. Kvantitative og kvalitative data blev indsamlet forud for gennemførelsen af forsøget for at fastlægge de studerendes præstationsniveau, og ligeledes bestemme deres fremskridt henimod det pædagogiske mål for kurset. Derudover blev kvalitative data bestående af målrettede interviews, observationer i undervisningslokale, dokumentanalyse og uformelle samtaler med både studerende og undervisere indsamlet under hele forløbet. En lokal teori blev udviklet både om læringsprocessen og de værktøjer, der har til formål at støtte indlæringen af kommunikationsfaget (CS) gennem et konstrueret læringsmodelforløb. Hovedprincippet for at bruge læringsmodelforløbet var at skabe en repræsentativ model for de læringsaktiviteter og støtteaktiviteter, der blev udført af de studerende og underviserne på ABLECAT i løbet af kommunikationskurset. Denne proces førte til brug af *'motivere, udforske, anvende og gennemgå/vurdere'* -modellen ABLECAT. Analysen af resultaterne viste bred accept af brugen af et blandet studiemiljø hos de studerende og underviserne. Der var mærkbar forbedring af de studerendes deltagelse og interaktion i kursusforløbet, som resulterede i en forbedring blandt de studerende på centrale områder af kommunikationskurset. Underviserne var også i stand til at interagere bedre med de studerende, end de plejede ved almindelig indretning af undervisningslokalet.

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Dedication

I dedicate this thesis to my wife, Mercy and my children, Freda, Abena, Kojo and Harry. May the Good Lord use this piece to bring us closer together as one big family unit.

Declaration

I, Samuel Adu Gyamfi do hereby declare that this thesis has been written based on the research undertaken by me since the approval of my study plan for the commencement of a PhD (Information Technology) study programme. Excepted where duly acknowledged, this work has not been previously submitted partly or wholly for any academic award in any other institution, that research ethics procedures were followed and any contributions made to this work, paid or pro-bono is duly acknowledged.

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List of Abbreviations

ABLECAT	A Blended e-Learning Environment for Collaborative and Active Learning
ADEA	Association for the Development of Education in Africa
AUTC	Australia Universities Teaching Committee
BALEAP	British Association of Lecturers in English for Academic Purposes
CALL	Computer-Assisted Language Learning
CD-ROM	Compact-Disc – Read Only Memory
CMC	Computer-Mediated Communication
CS	Communications Skills
DfID	Department for International Development
EAP	English for Academic Purposes
ELTIP	English Language Teaching Improvement Project
ESP	English for Specific Purposes
EUN	Egyptian Universities Network
F2F	Face-to-Face
GCE	General Certificate Examinations
GDP	Gross Domestic Product
GNI	Gross National Income
GSS	Ghana Statistical Service
ICT	Information Communications Technology
ICTs	Information and Communication Technologies
ICT4AD	Information and Communication Technology for Accelerated Development
IMF	International Monetary Fund
ILD	Integrative Learning Design
MDG	Millennium Development Goals
MERLIN	Multimedia Educational Research in Learning via an Information Network
MEXT	Japanese Ministry of Education, Culture, Science and Technology
NCTE	National Council for Tertiary Education
OUM	Open University of Malaysia
PHEA	Partnership for Higher Education in Africa
SAFE	South Africa Far East
SAT3	South Atlantic 3
SAP	Structural Adjustment Programs
SLA	Second Language Acquisition

SPSS	Statistical Package for the Social Sciences (Statistical Product and Service Solutions)
SRC	Students' Representation Council
SSSCE	Senior Secondary School Certificate Examinations
UNICEF	United Nations Children's Fund
UNISA	University of South Africa
USAID	United States Agency for International Aid
UEW	University of Education, Winneba
UK	United Kingdom
VLE	Virtual Learning Environment
WASC	West Africa Submarine Cable
WASSSCE	West African Senior Secondary School Certificate Examinations
WSIS	World Summit of Information Society

Chapter 1

1 Introduction

1.1 General introduction

In developing countries like Ghana, the metaphor of the information age has generated a whole set of speculation about the need for educational reforms that will accommodate the new information and communication technological tools (Sarfo & Ansong-Gyimah, 2010; & Pelgrum, 2001). In addition to making the teaching and learning of Information Communications Technology (ICT) a compulsory subject across all levels of education, major stakeholders in Ghana's education have responded to the challenge by creating national programmes to integrate new technologies tools such as computers, Internet, and intranet (Sarfo & Ansong-Gyimah, 2010). The President's Committee on Review of Education in 2002 in Ghana thus, recommended the provisioning of ICT infrastructure to facilitate teaching and learning towards the achievement of quality education at all levels of education especially at the university level to mitigate problems resulting from the massification at that level.

Besides being an important means of inter-ethnic communication internally and means of communication with the international community, the English language has exerted and continues to exert much influence over Ghana, where the English language is the only official language (Afful, 2007). As a consequence of the influence that the English language has on the country's human resource development, the major stakeholders of universities realised from the onset the link between academic literacy in English language and tertiary education, Lea & Stierer (2000). The influence of English language in Ghana has also engaged the attention of educationalists, applied linguists and other scholars interested in the use of language by students (Afful, 2007).

Johns & Swales (2002) has defined academic literacy to include a complex skills set and accomplishments required to access tertiary education as well as the skills required for an advanced learner to make an effective departure from universities to survive as an independent researcher. To facilitate the acquisition of academic literacy skills, all English-medium universities undertake to teach English for Academic Purposes (EAP) as a core course for all students on entering the university (Afful, 2007). Known in tertiary institutions in Ghana as Communication Skills (CS), the underlying premise of this foundation course required in all universities is that language skills could be de-contextualized from content and that academic language is similar across disciplines (Afful,

2007). It is also partly to stem the downward trend in the quality of writing of students in various disciplines.

In spite of these, there are continued criticisms from many stakeholders in university education in Ghana of the graduates being turned from the country's universities, especially with regards to communication skills at workplaces (Boateng & Ofori-Sarpong, 2002; Tagoe, 2009 & Afful, 2007). Boateng & Ofori-Sarpong (2002) attributed the problem of lack of students' communication skills to the method of teaching and learning which emphasizes on lecture and note taking approach in the universities with limited participation by students in the course. Given the class sizes, questions are rarely entertained and few faculty members maintain regular scheduled meetings with their students. Additionally, evaluation methods are basically end of semester written examination. These lead to rote knowledge of content rather than on the processes of thinking, learning and questioning (Tagoe, 2009). With very few departments giving term papers, writing skills are rarely tested leaving the students writing skills hardly improved (Afful, 2007).

Research literature on technology-enhanced language learning has proven to the various features of the power of technology for second language learning (Zhao, 2003; Chapelle, 2010; & Lai & Gu, 2011). For example the findings of Arslan & Şahin-Kızıl (2010) research on the use of ICT in English writing course show an improvement in specific areas of students' writing such as content and organisation. Additionally, ICT have been successfully used to facilitate students' collaborative writing processes and interactions, (Amir, Ismail, & Hussin 2010); fostering creative, analytical and critical thinking skills, creating social interaction and good relationships between writer and reader and supporting learning community (Noytim, 2010).

However, due to the various constraints that formal instructional contexts are subjected to, formal lecture rooms or the traditional classrooms have proven to be most resistant to these technological changes (Cuban, 2001 & Collins & Halverson, 2009).

This has resulted in the calls for the adoption of an approach to higher education that puts value on dialogue and debate which offers the utmost possibility of re-alignment to the ideals to higher education through the redesign of blended learning environments (Garrison & Vaughan, 2008).

Blended learning has been described as the combination of instruction, both methods and delivery media from two archetypal learning environments; the traditional face-to-face learning environment and an ICT-mediated or e-learning environment (Graham & Allen, 2009). This art of

teaching and learning has been practised by inspirational teachers for some time now (Littlejohn & Pegler, 2007).

According to Garrison & Vaughan (2008) a blended learning environment maximizes the capabilities of verbal and text communication for the particular experience, thus providing the opportunity for the utilization of a complex weaving of learning activities and techniques from a full spectrum of possibilities. The potential of blended learning environments is explicated in a number of success stories in the use of forums in a blended learning environment to achieve learning outcomes in English for Academic Purposes (EAP) courses (Bañados, 2006; Miyazoe & Anderson, 2010; & Miyazoe & Anderson, 2012), as well as recognition of high satisfaction levels among the students in the entire Communicative English programme (Bañados, 2006).

To overcome the challenges of the increased size and diversity of students, quality assurance requirements, and the rapid pace of technological change so as to provide effective blended learning systems in tertiary institutions (Littlejohn & Pegler, 2007), require specific skills on the part of the teacher to design a learning environment that is appropriate in a specific learning environment (Beetham & Sharpe, 2007; Laurillard, 2012; Conole, 2013).

It is in view of these that this study is being undertaken with the conviction that by using some of the ideas that learning design presents to develop a blended learning environment, the new learning environment would inure to the benefit of the students in their quest to improve on their knowledge and skills in a Communication Skills (CS) course. According to Mor and Craft, learning design is "the act of devising new practices, plans of activity, resources and tools aimed at achieving particular educational aims in a given situation" (Mor &Craft, 2012:86). In the context of this research, the existing infrastructure, both physical and technological, teaching and learning processes are inadequate to take advantage of the affordances of new technologies, therefore, effective design of using these new technologies in this context will require some rethinking of the whole curriculum process. Conole (2013) argues that effective design enables teachers to make informed use of technologies and incorporation of innovative pedagogical approaches, which can meet the challenges of a complex educational context. Therefore, for the specific coverage of this formative research, some of the ideas from a learning design perspective that are used comprise the design of the content or resources that were earmarked for the students to interact with, the tasks or activities that the learners were required to perform and the support mechanisms that were provided to assist the learners to engage with the tasks and resources in the new blended learning environment

(AUTC, 2003). These have been explicated in this research under the sub-heading "4.4 Design Phase of the Intervention – sub-sections 4.4.1 – 4.4.3.

This research study also takes the view that in order to better understand the complexity of designing a blended learning environment for the improvement of knowledge and skills of the students in the CS course, there is the need for a research strategy that takes into consideration the complex nature of classrooms where controlling multiple, interactive variables is often impossible (Brown, 1992; Reinking & Watkins, 2000; Dillion, O'Brien, & Heilman, 2000; Reeves, 2006; van den Akker, Gravemeijer, McKenney, & Nieveen, 2006). Such a research strategy is often found in formative experiments (Newman, 1990; Reinking & Watkins, 2000; Reinking & Bradley, 2008). Formative experiments are utilised by researchers who are interested in bringing about positive change in educational environments through creative, innovative, instructional interventions grounded in theory. Such researchers are often interested in testing those theories in the real world of teaching and learning in classrooms where those theories, are expected to be refined and modified in the course of their experiment (Reinking & Bradley, 2008).

1.2 The Statement of Research Problem

A commissioned report by the Association for the Development of Education in Africa – ADEA (Mohamedbhai, 2008) outlines the effects of large enrolment of students on higher education in Africa. Additionally, a report by USAID (2014), indicates that enrolment in higher education in Sub-Saharan Africa grew by 8.6 percent annually over the past 40 years, compared to 4.8 percent annually on average for the rest of the world. Furthermore, there were approximately 200,000 higher education students in Sub-Saharan Africa in 1970. This number had increased to 4.5 million in 2008 and to 6.3 million in 2011 (USAID, 2014). According to the ADEA report, the mass demand for higher education is creating great pressure on systems and institutions which are required to provide higher education of quality and relevance to the many students (Mohamedbhai, 2008). Again, in spite of these dramatic increases in numbers of students who were entering the tertiary institutions, public funding for higher education increased at only 6 percent annually in Sub-Saharan African countries from 1970- 2008 (USAID, 2014).

In the areas of teaching and learning, the ADEA report highlights the insufficient lecture rooms and theatres resulting in, for example, over-spill of students outside lecture theatres (cf. University of Ghana and University Cheikh Anta Diop, Senegal). Because of these large cohorts of students that these higher educational institutions admit yearly, the benefit of close interactions with

the lecturer that comes with tutorial sessions in small groups has been abandoned in many of the universities (cf. University of Edouardo Mondlane, Mozambique and Kenyatta University, Kenya). The large class sizes has also made it increasingly impracticable for the higher education institutions to make provision for adequate continuous or interim assessment of students (cf. University of Ghana) resulting in students graduating with little practice for critical analysis and writing (Mohamedbhai, 2008).

The problems in teaching and learning due to the large enrolment figures in African higher education institutions have led to the criticisms from employers and the general public of the low standard of education among recent graduates (Boateng & Ofori-Sarpong, 2002). In Ghana, a World Bank/Ghana National Council for Tertiary Education's commissioned report (Boateng & Ofori-Sarpong, 2002) on the study of labour market for tertiary graduates in Ghana cites the falling level of the quality of the tertiary graduate in the area of communication skills, a skill that most employers value most in a university graduate seeking an employment. This situation has been attributed to the large number of students that enrol each year in the universities (Boateng & Ofori-Sarpong, 2002; Tagoe, 2009).

The emphasis that employers place on communication skills has led the universities in Ghana to institute a two semester mandatory course in communication skills for all first year students. However, the development of this soft skill is still hampered by the large enrolment figures in the tertiary institutions (Boateng & Ofori-Sarpong, 2002). This is because teaching and learning of the communication skills course is often suitable for small class sizes (Nunan, 2004). In view of this assertion, there has been a call for the adoption of new teaching and learning environment which harnesses information and communication technologies in the teaching and learning of communication skills in the universities (Anamuah-Mensah, Asabere-Ameyaw, & Dennis, 2007).

Information and Communications Technology (ICT) has been noted as a powerful tool for coping with problems of teaching and learning when dealing with large numbers of students that the tertiary institutions in Africa are admitting (Mohamedbhai, 2008). Indeed, the USAID recommendation for action includes strengthening e-learning and the use of information and communications technology in higher education to meet the challenges of the mass enrolment of students in tertiary institutions in Sub-Saharan Africa. Specifically, the USAID report notes that: "first USAID's e-learning investments should focus on increasing the use of e-learning tools by existing African universities, rather than focus on developing fully online alternatives. Second,

investments should incentivize international collaboration and public-private partnerships to promote the adoption of innovative, scalable approaches to blended learning" (USAID, 2014: ix)

The ADEA report (Mohamedbhai, 2008), notes the development and availability of ICT with great improvements in computer-student ratio, well-stocked computer laboratories as well as access to the Internet for both students and lecturers (cf. University of Edouardo Mondlane, Mozambique, National University of Science and Technology, Zimbabwe and the University of Nairobi, Kenya). Some of the tertiary institutions have therefore begun to take advantage of the opportunities ICT offers in a teaching and learning environment as the innovative approach to address the massification of student admissions. In the area of teaching for instance, the University of Cheikh Anta Diop has inter-connected several lecture rooms to facilitate simultaneous lectures via video to avoid a lecturer having to deliver the same lecture to different groups at different lecture rooms at different times(Mohamedbhai, 2008). To help alleviate the problems associated with massification of tertiary education, the tertiary institutions in Africa continue to explore and advance the use of ICT in learning as another effective way of dealing with the problem of large class sizes. Learning technologies such as online database of resources including lecture notes, audio-visual materials posted to the university's website, computer-based tutorials, online quizzes, simulations and other materials on the Internet for use by the students has also been implemented (cf. The University Cheikh Anta Diop, Senegal, University of Nairobi, Kenya and the National University of Science and Technology, Zimbabwe).

The use of ICT in teaching and learning, often referred to as e-learning has been used widely for teaching and learning in the university environment (Littlejohn & Pegler, 2007). Indeed, the use of ICT in teaching and learning has the potential of not only freeing lecture rooms for other uses and the lecturers for other activities, but it also equips students with the requisite ICT skills which is vital for their career after school (Mohamedbhai, 2008). However, many educational researchers have highlighted the limitation of using e-learning alone in the teaching and learning of soft-skills based course such as communication skills (Sarfo & Ansong-Gyimah, 2010; Garrison & Vaughan, 2008). A combination of the traditional classroom setting and the ICT enabled teaching and learning platform has therefore, been suggested for the improvement in the teaching and learning of communication skills (Bañados, 2006 & Calabrese & Faiella, 2011).

In Ghana, the increasing access to ICT infrastructure and services coupled with the growing digital generation who are being admitted to the universities are providing a fertile ground for the use of ICT or e-learning platforms in the tertiary institutions. However, one cannot lose sight of the

increasing relevance of the face to face classroom settings in the development of soft skills such as communication skills.

This study therefore, uses formative experiment to study the use of blended learning environment in the teaching and learning of communication skills in the Ghanaian universities. Blended learning has been described as the combination of instruction, both methods and delivery media from two archetypal learning environments; the traditional face-to-face learning environment and an ICT-mediated or e-learning environment (Graham & Allen, 2009; Garrison & Vaughan, 2008). This study thus examines how the use of blended learning environment facilitates the effectiveness of the teaching and learning of communication skills from the perspectives of both students and lecturers.

1.3 The Context of the Research

> "Educational research that is detached from practice may not account for the influence of contexts, the emergent and complex nature of outcomes, and the incompleteness of knowledge about which factors are relevant for prediction". (DBRC, 2003:5)

Educational design researchers study not only the immediate context of the research study, but also the surrounding systems in order to understand how, why and under what conditions the intervention work (McKenney & Reeves, 2012). Again such an intervention must be studied in an authentic instructional environment where all naturally occurring variation is allowed to operate and where instructional responses to that variation are not unnaturally constrained by the researcher (Reinking & Bradley, 2008). Therefore, this section has been used to explain the institutional context of the research.

This research study was conducted at the University of Education, Winneba (UEW) in Ghana. This university was established in September, 1992 as a University College. It brought together seven diploma awarding colleges located in four different towns of the country under one umbrella institution. On 14th May, 2004 the University of Education Act, Act 672 of the Parliament of the Republic of Ghana was enacted to upgrade the status of the University College to the status of a full government-owned university. UEW has been mandated by Act 672 to train competent professional teachers for all levels of education as well as conduct research, disseminate knowledge and contribute to educational policy and development in Ghana in particularly and globally as a whole. Currently, the university has nine faculties which run full time postgraduate, undergraduate

degree and diploma programmes (**see Table 1-1**). These faculties are spread on four campuses. The main campus, Winneba, hosts four faculties, namely, Social Science education, Education Studies, Creative Arts Education and Science Education. Ajumako Campus hosts Languages Education. Mampong Campus hosts Agriculture Education and the Kumasi Campus hosts Business Education, Technical/Vocational Education and Education and Communication Sciences faculties (**see Table 1-1**).

Table 1-1: Summary of Faculty Enrolment (Full-Time), 2010/11

Faculty	1st Year Students	2nd Year Students	3rd Year Students	4th Year Students	TOTAL Students
Social science (Winneba campus)	550	334	291	243	**1,418**
Educational studies (Winneba campus)	670	572	397	367	**2,006**
Agriculture Education (Mampong campus)	501	383	482	435	**1,802**
Languages Education (Ajumako campus)	698	588	549	492	**2,327**
Business Education (Kumasi Campus)	***609***	***668***	***763***	***802***	***2,842***
Creative Arts Education (Winneba campus)	415	387	373	359	**1,534**
Technical/Vocational Education (Kumasi Campus)	***565***	***1,073***	***1,012***	***696***	***3,346***
Science Education (Winneba campus)	587	532	588	551	**2,261**
Education and Communication Sciences (Kumasi Campus)	***57***	***37***	**-**	**-**	***94***
TOTAL	**4,652**	**4,574**	**4,455**	**3,945**	**17,630**

Source: Basic Statistics of Vice-Chancellor's Annual Report to the16th Congregation of the University

1.3.1 Student Enrolment

At the time this study began, the total number of the student population of the university stood at 50,012 students, made up of 17, 630 full time students, 23,746 distance learning students and 8,636 students on sandwich/part-time study (**see Table 1-2**).

Table 1-2: Summary of Students' Enrolment by Programmes and Mode of Study, 2010/11

Mode of Study	Undergraduates			Postgraduates			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Full-time	11,813	5,287	**17,100**	377	153	**530**	12,190	5,440	**17,630**
Distance	10,372	13,374	**23,746**	-	-	**-**	10,372	13,374	**23,746**
Sandwich/Part-time	4,011	2,840	**6,851**	1,156	629	**1,785**	5,167	3,469	**8,636**
Total	**26,196**	**21,501**	**47,697**	**1,533**	**782**	**2,315**	**27,729**	**22,283**	**50,012**

Source: Basic Statistics of Vice-Chancellor's Annual Report to the16th Congregation of the University

Since its inception in 1992, the university has witnessed a study increase in its first year enrolment figures over the period (**see Table 1-3**). When the four campuses were amalgamated to form the University College of Education, Winneba in 1992, the first year admission stood at 481 students. At the time of this research, the total number of first year admissions stood at 4,399 students. As pertained in most public tertiary institutions in Africa, the University of Education, Winneba has not witnessed any appreciable academic and infrastructural development and expansion to accommodate the growing number of students enrolment since its inception (Anamuah-Mensah, Asabere-Ameyaw, & Dennis, 2007; Mohamedbhai, 2008; Tagoe, 2009). Consequently, due to the overstretch of its facilities and infrastructure, the Kumasi campus, where this research study was conducted, had to cut down the total number of first year admissions for the period 2010/2011 academic year (**see Table -1-1**).

Table 1-3: Trend of New Entrants (Full Time) by Sex 1992/93 - 2010/11

Year	1992/93	1993/94	1994/5	1996/97	1997/8	1998/99	1999/00	2000/01	2001/02
Male	338	433	511	1,063	1,186	1,771	2,329	2,355	2,231
Female	143	169	191	323	501	794	1,011	1,179	924
Total	**481**	**602**	**702**	**1,386**	**1,687**	**2,565**	**3,340**	**3,534**	**3,155**
Year	**2002/03**	**2003/04**	**2004/05**	**2005/06**	**2006/07**	**2007/08**	**2008/09**	**2009/10**	**2010/11**
Male	1,843	1,801	2,195	2,626	2,788	3,024	2,730	2,800	3,063
Female	861	959	1,487	1,451	1,215	1,420	1,328	1,129	1,336
Total	**2,704**	**2,760**	**3,682**	**4,077**	**4,003**	**4,444**	**4,058**	**3,929**	**4,399**

Source: Basic Statistics of Vice-Chancellor's Annual Report to the 16th Congregation of the University

1.3.2 Faculty staff

As at the time this research study began, the total number of staff of the University stood at 1,710 made up of 381 teaching staff, 1,066 central administration staff and 263 supporting staff at the various teaching departments (**see Table 1-4**). While admitting that some faculties might have more teaching staff than others, it can also be said that, the total number of teaching staff (381) that service the full time students of 17,630 is woefully inadequate. This is approximately 1:46 (a ratio of one lecturer to 46 students) well above the National Council for Tertiary Education requirement of 1:27 (a ratio of one lecturer to 27 students) for social sciences, humanities and business administration programmes (NCTE, 2012).

Table 1-4: Staffing Summary (As at June 30, 2011)

Category	**Number**
Teaching staff	381
Central Administration Staff	1,066
Supporting Staff at the Teaching Departments	262
Total	**1,710**

Source: Basic Statistics of Vice-Chancellor's Annual Report to the 16th Congregation of the University

1.3.3 Academic facilities and infrastructure

In view of the fact that the university has resorted to admitting large number of students every year, almost all the lecture rooms have been designed to accommodate between sixty (60) to one hundred and twenty (120) students at a lecture. These lecture rooms contain enough tables and chairs to accommodate the numbers. They have white marker boards which the lecturers use to write on. There are neither public address systems nor electronic projectors permanently fixed in these lecture rooms. There are no small rooms for group meetings and or work for both lecturers and students.

Table 1-5: Facilities at the Kumasi Campus Library

Services	Quantity as at June 30, 2010	Quantity as at June 30, 2011	Available as at June 30, 2011	Accessibility	Hrs. per wk.	Remarks
Books	18,404	25,948	18,597	Univ. c'nty& public	78	
Serial titles	160	163	163	Univ. c'nty& public	78	
Journal titles	84	86	86	Univ. c'nty& public	78	
Online journals	22,147	23,000	22,147	Univ. c'nty& public	78	
Online databases	35	36	36	Univ. c'nty& public	78	
Photocopier	Nil	Nil	Nil	Nil	Nil	
Networked PCs	32	31	31	Univ. c'nty& public	78	
Catalogue cabinet	1	1	1	Univ. c'nty& public	78	
Virtual library mgt. system	15,251	100,000	22,306	Library staff	72	Titles

Source: Basic Statistics of Vice-Chancellor's Annual Report to the 16th Congregation of the University

The Kumasi campus has a library that has in stock a number of books for the various disciplines (**see Table 1-5**). The university also subscribes to a number of journal titles and online databases. The library has a number of networked computers which the students and the general public could use for academic purposes. In addition to the above-mentioned academic facilities, the campus has two large computer laboratories which are stocked with 95 networked computers each (**see Table 1-6**). These computer laboratories are used for instruction in ICT-based courses. Furthermore, there is open wireless Internet access on both the campus and the university halls of residence which is supplied by Vodafone Ghana on a monthly subscription.

Table 1-6: Distribution of computers and Internet access on the University's campuses

Campus	**Networked computers**	**Internet bandwidth**	**Internet Service Provider**
Winneba	730	92 mbps	Vodafone Ghana
Ajumako	94	2 mbps	Vodafone Ghana
Kumasi	**190**	**10 mbps**	**Vodafone Ghana**
Mampong	105	6 mbps	Vodafone Ghana
20 study centres	140	40 mbps	Vodafone Ghana

Source: Vice Chancellor's address to Convocation – April 2011

The Kumasi Campus of the University was chosen as the location of the study first and foremost because available research on CS at other universities in Ghana suggests relatively high failure rates among students in the CS course (Coker & Abude, 2012), contrary to the available data from the Kumasi campus of the University (**see Table 1-7**). The site was also convenient due to its proximity to the researcher and good relationship with the institution which facilitated the access to the students, lecturers and the other infrastructure used in the study.

Table 1-7: General Performance of Students in the CS course - Kumasi Campus

Year/ Grade	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
A	19	1	68	79	35	68	88	217	229	34	107
B+	31	6	92	78	64	137	123	175	219	131	183
B	98	33	101	92	96	172	136	249	162	224	261
C+	102	109	102	109	108	87	137	153	95	168	206
C	155	139	87	88	74	46	142	78	49	151	137
D+	101	161	39	52	50	21	107	35	19	65	76
D	82	178	15	58	23	16	62	12	12	37	74
E	9	5	40	2	10	0	25	0	0	6	12
IC	0	0	0	38	1	0	10	6	3	9	10
Total	**597**	**632**	**544**	**596**	**461**	**547**	**830**	**925**	**788**	**825**	**1066**

Source: University of Education, Winneba Online Students Information System (2012)

1.3.4 Instructional strategies and methods

Teaching and learning in higher education in Ghana has to contend with deep-rooted complex issues and problems stemming primarily from previously changes in the education system. The country's educational reforms in 1987, abolished the General Certificate in Education, both Ordinary and Advanced Levels, which were likened to the UK system, and brought in a shortened duration of basic and second cycle education of twelve years duration instead of the previous seventeen years. With the changing nature of the country's economy, more and more people from different eras of the education system are enrolling in the universities to upgrade themselves (Tagoe, 2009). The university's admission requirements have therefore, been crafted to suit and cater for everybody who wishes to enrol on their programmes. Therefore, some of the complex challenges of the university revolve around student diversity in terms of academic preparedness, language and

schooling background, and multilingualism in a first language context. In addition, large classes are an endemic feature of most university courses posing an additional challenge in the teaching of a diverse student population when it comes to choosing an appropriate instructional strategy. Additionally, large class sizes make it difficult for teachers to employ interactive instructional strategies (Nicol & Boyle, 2003) or to gain insight into the difficulties experienced by students. Large classes pose problems for all students but students who are under-prepared are particularly affected (Jaffer, Ng'ambi, & Czerniewicz, 2007).

An instructional strategy can be termed as the approach a teacher adopts in using information, selecting resources and defining the roles of students in a teaching and learning situation (Heinich, Molenda, Russell, & Smaldino, 2002). In the research context, the instructional strategy is mainly expository. This is a teaching approach in which the teacher just presents to the learners the information needed to achieve the learning objective. Testing is conducted for reception, recall and understanding through repetition or rephrasing of the message, when necessary by the teacher. In this strategy, there are limited opportunities for learners to practice as well as limited opportunities for application of the newly acquired knowledge to real life situations by the learner (Biggs, 2003). The instructional method (procedure or set of techniques selected by the teacher to help the learners experience the message the teacher wants to put across) in this context is mainly presentation/lecture. The lecturer/teacher tells, dramatizes or otherwise disseminates information to the learners in a one-way communication with no immediate response from the learners. This instructional method helps the lecturers to cover more content with little time and it is an appropriate method for teaching large and diverse classes which they are confronted with in the research context (Biggs, 2003). Additionally, most lecturers teach from prepared hand-outs of their lecture which the students listen to and copy for revision and knowledge acquisition. The down side of this method is that it contributes to rote learning of facts, principles and terminologies leaving minimal room for application of knowledge in similar contexts (Heinich, Molenda, Russell, & Smaldino, 2002; Boateng & Ofori-Sarpong, 2002). Both the instructional strategy and method that are mostly applied in this research context pose a serious challenge for students' assessment and the conduct of examinations. In view of the large number of students, it has become increasingly impracticable for the lecturers to make provision for adequate continuous or interim assessment of students learning. For example, for a period of a minimum of 16 teaching weeks in a semester, one often finds lecturers conducting one continuous assessment, a situation which results in students graduating with little practice for critical analysis and writing (Mohamedbhai, 2008). Additionally,

when it comes to setting of questions for examinations purposes most lecturers opt for structured and multiple choice questions which are easier to mark. Such questions, at best, test the students' knowledge rather than application (Biggs, 2003; Mohamedbhai, 2008).

1.4 Rationale of the study

According to Tagoe (2009) there is a seeming crisis of transition of university graduates to the world of work particularly in the emerging and other developing countries. This has been attributed to lack of the requisite skills and abilities which employers look out for in graduates who enter the world of work today (Humphreys, Greenan, & Mcllveen, 1997; Hyland, 2006). Among the skills often cited in the literature and which most employers currently look out for in graduates is *Communication Skills* (Harvey, 2003; Bruen, et al., 2005; Tagoe, 2009).

The rationale for this study therefore is to propose and use some of the ideas that learning design research presents in a blended learning environment using formative experiment as the research approach. It is believed that the development of these tools, design methods and approaches and the resultant blended learning environment could help teachers to design pedagogically effective teaching and learning activities which makes effective use of information and communications technologies (Mor & Winters, 2007;Conole, 2013). The current pedagogical approach in the research context was redesigned to give the students a vision of CS that could engender greater dialogue in the lectures, recommend more interesting reading materials in multiple formats, give better conceived assignments, and ultimately make learning enjoyable (Benesch, 2001) by combining both the traditional classroom environment and information and communication tools such as internet-based learning management system. Additionally the study seeks to propose the utilization of blended learning environment as a means to collect and assess relevant information for re-designing CS courses by establishing the how and the what of the course (Hyland, 2006).

While focusing on the redesign of the learning environment to provide the learning needs of the students in the CS course, the study takes cognizance of the fact that the context within which today's students learn is saturated with ICT tools for accessing and managing educational materials and for communicating with others anytime and anywhere (De Freitas & Conole, 2010). While also acknowledging the fact that there is a gap between the potential of these technologies and their actual use in practice on the part of the students, there is also the suggestion that some teachers lack the necessary skills to make informed decisions about how to use these technologies effectively in their teaching (Conole, 2013).

Therefore, this research study would demonstrate that, designing a blended learning environment that brings the *target needs* and the *learning needs* of the students together as well as bringing together the best of the traditional classroom teaching and learning situation with the offerings of available and useful ICT tools (blended learning environment) could improve the knowledge and skills of the students in the CS course.

1.5 Significance of the research study

The advent of ICT has also led to the development and research in Computer-Assisted Language Learning (CALL) and hence the suggested improved quality of CS's (EAP) teaching and learning (Levy, 1997; Warschauer & Healy, 1998; Nesi, 1998; Chapelle, 1998; 2001; 2003; Debski, 2000; Warschauer & Kern, 2000; González-Lloret, 2003; Gruba, 2004). However, due in part to the perceived limitations and constraints of CALL, (Levy, 2002; Hémard & Cushion, 2001) a number of researchers have explored the potential of blended learning environment for CS.

This study would highlight the potential of blended learning environments to the achievements in learning outcomes in EAP (CS) courses. The study additionally validates the perception of the achievement of high level students' satisfaction in blended learning environments for the teaching and learning of CS (Bañados, 2006; Pastor, 2009; Calabrese & Faiella, 2011).Using formative experiment as a methodology for the study of technologically supported learning is novel in the Ghanaian context. This makes the study one of a kind in developing effective learning design sequence and using a blended learning environment for the teaching of CS course in the Ghanaian tertiary level of education

Much of the research on the use of blended learning environments in CS (EAP) classrooms has occurred in Europe, the Americas, Australia and the Far East. On the African continent, where there is a considerable number of universities that go through the CS programme not much research has been recorded on the use of blended learning environments for the delivery of CS. By taking into account the peculiar nature of ICT infrastructural development on the continent, this research study would serve to make a contribution to the literature on the design and implementation of a blended learning environment for the improvement of knowledge and skills of the students in the CS course while seeking to determine what facilitates or impedes its successful implementation.

There is also a considerable evidence of formative experiments being used successfully for literacy research (Newman, 1990; Reinking & Pickle, 1993; Jiménez, 1997; Reinking & Watkins, 2000; De Corte, Verschaffel, & Van de Ven, 2001; Fisher, Frey, & Lapp, 2009; Ivey & Broaddus,

2007; Baumann, Ware, & Edwards, 2007; Bradley & Reinking, 2011a). However, few of them involved the use of ICT. Again, not much of research has been conducted in the tertiary education level when it comes to the use of formative experiment as a research strategy for the study of the effectiveness of a blended learning environment for the teaching and learning of CS. This research study would thus, serve to make a contribution in that regard.

1.6 The purpose of the research study

The purpose of this research study was to design and implement a blended learning environment to improve the knowledge and skills of undergraduate students in a CS course in tertiary institutions in Ghana. The focus of this study is underpinned by the propositions that by;

(i) providing learning resources in multiple formats in the blended learning environment it would sustain the students' interest in the course and thereby promote their cognitive engagement in the course;

(ii) providing ICT tools in the blended learning environment it would promote the students' interaction and collaboration with their peers and the lecturers; this would promote their motivation in the course and ultimately enhance their cognitive development in the course;

(iii) providing technological tools that enable immediate feedback on task and activities for the students it would build their understanding and use of the concepts in the course. These provisions would help improve their knowledge and skills in the CS course.

This research study uses a formative experiment research strategy, which focuses on achieving a valued pedagogical goal and is guided by questions aimed at revealing how the intervention could be implemented to achieve them (Reinking & Watkins, 2000).

1.7 The Organization of the Research

This study is organized into seven chapters. Chapter 1 provides general introduction to the study with the purpose and significance of the research. Chapter 2 is used to review relevant literature on CS and online learning; blended learning environment and formative research which facilitated the establishment of the pedagogical goal and the intervention proposed for the research. In chapter 3, the methodological approach to the study is discussed in detail. It explains the methods used in the gathering of data for each phase of the intervention. Chapter 4 provides the details of the pre-intervention data collection procedures, analysis of the data and the design of the

intervention. The two cycles of the intervention, namely the design and implementation of ABLECAT are presented in chapter 5.Chapter 6 concentrates on the post implementation analysis of the blended learning environment (ABLECAT) with the justification of the design proposition introduced in chapter 4. Chapter 7 is a presentation of the findings, implications, limitations and the conclusions drawn from the study.

Chapter 2

2 Review of related literature

2.1 Introduction

The pedagogical goal of this study is the design and implementation of a blended learning environment to improve the knowledge and skills of undergraduate students in a CS course. The value and importance of this goal have been partly explained in the *rationale* and the *significance* of this research study in the first chapter. This chapter thus, explicates what theories and previous empirical work speak to accomplishing that goal, instructionally. Additionally, it argues for the intervention that is consistent with a guiding theory, and has the potential to achieve the pedagogical goal and the reason(s) for that choice.

2.2 Communication Skills and Higher Education

English for Academic Purposes (EAP) is a core foundation course taught in tertiary institutions aimed at helping learners to study, conduct research or teach in that language (Flowerdew & Peacock, 2001).In contemporary society, EAP is considered and has become an integral part of school curriculum in a number of geographical locations worldwide. Most English-medium universities in non-native settings have different labels for EAP in their respective countries. According to Afful, (2007), in Singapore, for instance, most higher education institutions prefer to use the term EAP, or follow the English for Specific Purposes (ESP) tradition, with terms such as *English for Business* or *English for Engineering*, in order to position the writing program in specific disciplinary contexts. Universities in Africa rather, generally, use labels such as *Communicative Skills*, *Communication Skills*, or *Use of English.* Afful (2007) posits that the differences in the labels are indications of differences in the curriculum, pedagogy or even philosophical orientations. The curriculum of most EAP programs in African and Indian universities places emphasis on the written aspect. However, Singapore and Hong Kong follow the British model by adding speaking and listening aspects (Afful, 2007). In this thesis *Communication Skills* is used to refer to EAP to conform to the nomenclature in other universities in Anglophone Africa.

In recent years, many countries have begun to assess the effectiveness of CS programmes of higher education. Results from these assessments are presented at Professional Issues Meetings of the British Association of Lecturers in English for Academic Purposes (BALEAP). These

assessments are meant to influence educational policy developments with regards to CS in concerned countries (Plews, 2010).

Globally, there have been educational reforms aimed at the development of standards for teaching and learning of CS. For example, the Japanese Ministry of Education, Culture, Science and Technology (MEXT), issued an 'Action Plan to Cultivate Japanese with English Abilities' (2003 – 2008) (Toyama, 2003).

The UK government's Department for International Development (DfID) between 1997 and 2008 funded the 'English Language Teaching Improvement Project' (ELTIP) with the aim of strengthening the human resource development efforts of the Bangladeshi Government (Seargeant & Erling, 2011).The programme initiators hoped the ICT-supported infrastructure would bring about quality English language education and also create interest in the learning process.

Education in Ghana typifies a special case of the teaching and learning of 'Communication Skills' course where the application of information and communication technology has played and continues to play minimal role. In spite of the obvious British influences in the country, Ghana is still racially homogeneous and multilingual society. About 80% of the population speak 'Akan' as their first or second language (GSS, 2012). The Akan speaking community has a strong intra-group cohesion, and speakers keenly maintain the use of their language. Indeed, Akan is the preferred medium of communication when two or more people meet and they have not gone through formal education. Consequently, the English language plays a negligible social role in the daily lives of most Ghanaians.

The English language, however, is used at higher levels of administration and business, especially in written communication. There is positive correlation between one's knowledge of the English language and the individual's income, social prestige, and educational level. As a result, English has a strong image of marketability among the Ghanaian community. Because of the material benefits the language offers, recent surveys have found a strong motivation to learn English for academic and career purposes (Owu-Ewie, 2006). The economic importance of English language is reflected in a colonial system where English language is the de facto medium of instruction for virtually all secondary and tertiary students. But, while language planners are increasingly questioning the validity of using a language of wider use rather than a national language of limited international currency, there is a widespread belief among both parents and students that English medium education results in a better standard of English (Anamuah-Mensah, Asabere-Ameyaw, & Dennis, 2007).

Most students who are admitted to the universities in Ghana often struggle with the English language due to varieties of reasons (Owu-Ewie, 2006). The institution of the '*Communication Skills'* course for all first-year students at the higher education level in Ghana is meant to serve a dual purpose. Firstly, the (CS) course serves as a remedial course meant to deal with the language deficiencies of the students. Secondly, the course serves as a foundational course meant to empower the students to function effectively in the university community in terms of their ability to perform various academic tasks (Afful, 2007).There have been strong suggestions for the incorporation of ICT in the teaching and learning of CS to ensure that students are well knowledgeable in the language since ICT offers a range of learning tools that facilitate effective teaching and learning (Jarvis, 2001 & Chapelle, 2003).

The literature reported in this section highlights the changing nature of Communication Skills (CS) and how CS teaching and curriculum need to respond to these changes and meet the challenges presented by the growing importance of CS learning for society. Although policy level initiatives such as development of national standards are highly popular there is a parallel need for educational intervention and support that enable students to experience success in learning CS.

2.3 Communication Skills in Online Learning Environments

Advances in modern information and communication technologies have enabled educational developers to create increasingly sophisticated and powerful tools for teaching and learning of CS. Information and Communication Technologies (ICTs) now have the capabilities and enormous potential to transform the teaching and learning of CS in higher education (Jarvis, 2001). During the past few years newer and more sophisticated range of products have become available and are aimed at delivering CS in a multimedia environment such as 'Essential Academic Skills in English' and 'EXCEL at Academic English' (Jarvis, 2004). There is no doubt that these technological tools and software can be effective and useful in teaching and learning of CS but their pedagogical use by students both in educational settings and in their own homes needs to be thoroughly thought through.

English Language educators and researchers have been interested in exploiting the potential of Internet based technologies for teaching and learning of the language for some time now (Warschauer & Healy, 1998). Indeed, Bax (2003) has provided a review account of the *historical approaches* of the use of ICT in the teaching and learning of English language first outlined in Warschauer & Healy (1998).

The first approach was termed restricted Computer-Assisted Language Learning (CALL). The term stems from the fact that in this approach, the actual software and activity types that were used, the teacher's role and the feedback offered to students were all pre-programmed. The teacher's role in this approach was that of a monitor, while the syllabus and learner needs in the curriculum were not taken into account when the software was introduced. The students' activities in this approach were mainly text reconstruction, answering of closed questions and minimal interaction with students.

The second approach that (Bax, 2003)proposed was termed Open CALL. In this approach, the tasks and activities that were given to students involved the use of simulations, games and Computer-mediated communication (CMC). Students' interactions with the computer and other students were also promoted. To develop the students' linguistic skills, focus was placed on the necessary feedback in the software. The teacher's role in the teaching and learning situation of this approach was that of a monitor and a facilitator. The term "Computer-mediated communication" (CMC) broadly describes many of the instructional delivery mechanisms that can support complex processes of interaction that are essential to e-learning (Bannan-Ritland, 2003). CMC therefore, deals with communication between two or more people through the use of a computer. Generally, CMC encompasses the use of e-mail, bulletin boards, discussion lists, and computer conferencing, both text-based and video-based (Levy, 1997). There are two main types of CMC, synchronous (for example: chat or instant messaging) and asynchronous (for example: bulletin boards, computer conferencing and e-mail). In a synchronous CMC environment, all learners/users have to be logged on online simultaneously in order to participate, whereas with asynchronous CMC, learners/users may read and reply to online messages at any time (Chapelle, 2003). In a computer-mediated learning environment, tools such as computer conferencing or chat enable users to communicate with each other. CMC tools can also allow direct real-time or asynchronous teaching/feedback from the lecturer and enable students with questions to seek advice from lecturers and/or peers (Chapelle, 2003). Since CMC provides opportunities for language learners to practice their language, it is widely discussed in the literature of language learning (Levy, 1997). For example, Kanselaar et al evaluated with upper secondary school students a program designed to support collaborative argumentative writing and found that the communicative function of the chat tool had a beneficial effect on text quality (Kanselaar, et al., 2003). Therefore, in this part of the review, the term CMC has been used to reflect its historical use in language learning taking cognizance of the fact that the term forms part of the broader ICT tools (Sayago, Sloan, & Blat, 2011).

The third approach of the use of ICT in the teaching and learning of languages is termed as the Integrated CALL (Bax, 2003).In this approach, the content is integrated language and skills development and the students' tasks comprise of the use of CMC, word processing and email. Students' activities involve frequent interaction with other students and some interaction with the computer and the teacher throughout the lesson. Feedback involves interpreting, evaluating, and commenting that stimulate thought. The teacher's role is that of a facilitator and manager. The technology's position in the curriculum is that of a tool for learning, normally integrated into the syllabus and adapted to learners' needs (Bax 2003).

The third approach as outlined above opens the avenue for CS teaching and learning online. The integrated approach involves the use of multimedia networked computer because the technology now provides a range of informational, communicative, and publishing tools which are now potentially at the fingertips of every undergraduate student (Warschauer & Healy, 1998). These technological tools provide not only the possibilities for much more integrated uses of technology, but also the imperative for such use. Therefore, learning to read, write, and communicate through the use of the computer becomes an essential feature of the life of the undergraduate student of the CS course.

Jarvis, (2001) also provides the use of the Internet in the CS classroom from the days of the establishment of the Multimedia Educational Research into Learning via an Information Network (MERLIN) project http://www.hull.ac.uk/merlin/ at the University of Hull (UK) which began in 1995. The MERLIN project simplified the time-consuming administrative aspects of the CS course through the use of ICT tools that supported interaction and collaboration between groups of remote learners and their teachers.

From this inception, various studies on the use of the Internet and its technological tools to facilitate the teaching and learning of CS as well as its attendant advantages have been documented:

(i) the Internet, in serving as a means of communication, allows students around the world to interact with one another cheaply and quickly and often free of charge, for instance, in school networking as well as opening up the CS classroom to the real world(Windeatt, Hardisty, & Eastment, 2000)

(ii) the Web provides a wide variety of text types, which can be especially useful for practising vocabulary and grammar in the language in a range of contexts (Jarvis, 2001);

(iii) in the CS classroom, timid and inhibited students can benefit from meaningful interaction and communication that e-mail makes possible. Furthermore, either in individualized, student-centred or in collaborative learning every student can work at their own pace without preventing their peers' work (Singhal, 1997)

(iv) additionally, students' social skills can be developed through interaction and cooperation in and out of the CS classroom among members of groups, and through communication with students from other schools in an online learning environment. What is more, students are given maximum opportunity for social interaction, which does not only provide them with comprehension input but also gives them practice in the kinds of communication they will engage in later(Windeatt, Hardisty, & Eastment, 2000).

However, these laudable advantages, notwithstanding, pedagogical challenges began to emerge since most implementations of ICT for the development of language skills ignore important decisions such as the pedagogical principles behind the software and hardware (Bax, 2003; Chen, Belkada, & Okamoto, 2004).

Therefore, it has been observed that if CS online is to achieve its true potential, practitioners should view the Internet as a pedagogical tool for delivering specified learning outcomes (Jarvis, 2001). For instance, in order to sustain students' motivation, it is important to cater for the variety of students' learning styles, interests and skills levels by building sufficient flexibility into the materials for the students' CS learning online (Strambi & Bouvet, 2003).

Additionally, teaching and learning of CS online present challenges of reduced opportunities for face-to-face communication, development of learning autonomy and the need for effective support systems (Strambi & Bouvet, 2003; Sampson, 2003;& Harker & Koutsantoni, 2005). It is therefore, important to design teaching and learning environments that would present the necessary pre-requisites for learning authenticity and interactivity (Strambi & Bouvet, 2003).

The ability of the Internet and its array of ICT tools to promote interaction have been studied extensively in relation to Computer-Mediated Communication (CMC) tools and the development of Communication skills (Strambi & Bouvet, 2003). CMC tools make the communication through the computer possible while also creating additional avenue for students' negotiation of meaning that is also achieved through face-to-face interaction. Due to some aspects of its form which are written in nature, CMC tools also make interaction in the Communication Skills classroom even more effective. Strambi & Bouvet, (2003) observe that learners' participation

in Computer-Mediated Communication (CMC) seem to produce more complex and accurate instances of language than they do in oral conversation because by using CMC tools, learners have more time for reflection and opportunities to access reference materials, which translates into better opportunities for comprehension, as well as an enhanced ability to engage in planning and monitoring of one's output in Communication skills.

The following sections have been used to discuss the design and development issues in facilitating CS learning content online and how current research and development are breaking new grounds in producing interactive content for web-based CS learning. Later in the section there will also be a report on selected research from the higher education sectors where blended learning environments are used in teaching and learning of CS.

2.4 The Place of Information and Communications Technology (ICT) in Higher Education in Africa

2.4.1Introduction

> "Understanding precisely how ICTs can make a difference to the lives of the poor and the marginalised does indeed depend in part of their contribution to economic growth, but it is also concerned with issues to do with the access that people have to information, about the ways in which those from different backgrounds communicate with each other, and about the content requirements that poor people need if they are to be able to transform their lives and livelihoods" (Unwin, 2009:1)

Since the United Nations (UN) General Assembly's decision to host the World Summit on the Information Society (WSIS) in 2001, Africa has experienced an explosion of activity in the ICT landscape (Balunywa, van Diepen, Dijkstra, Henriquez, & White, 2009). The explosion of activities in the ICT landscape has been necessitated by the realisation that priority should be given to ICT applications for the poor in developing countries (Heeks, 2008). This argument is buttressed by the application of ICT being tied to the realisation of Millennium Development Goals of the United Nations in 2000 on the human development – a popular perspective used to inform policies and programmes at national and international levels aimed at improving the lives of the poor and marginalised in the world (Unwin, 2009).

2.4.2 An overview of Africa's development situation

In the 1980s and 1990s African countries experienced deep development crisis in their economic, social, political, health, environmental and technological components (Cheru, 1989; World Bank, 1990; Nyango'oro & Shaw, 1992 & Bloomstrom & Lundahl, 1993). As well as been well-documented, the development crisis in Sub-Saharan Africa in the 1980s is also reflected in several conventional indicators.

As depicted in **Table 2-1,** Sub-Saharan Africa has both the highest Under-5 and infant mortality rates in 2004. In 2002, for example, out of 1,000 live births, 174 and 106 children died in Sub-Saharan Africa before reaching ages 5 and 1 respectively, whilst in industrialised countries out of 1,000 live births, 7 and 5 children died before reaching ages 5 and 1 respectively. Apart from Sub-Saharan Africa recording the lowest Gross National Income, the region had the highest concentration of poverty as measured by the percentage of her population living below 1 USD per day. This situation further accounts for Sub-Saharan Africa recording the lowest life expectancy rate.

Table 2-1: Basic development indicators comparing Sub-Saharan Africa with other selected regions

Region	Under -5 mortality rate (2002)	Infant mortality rate (2002)	GNI per capita in US$ (2002)	GDP per capita average annual growth rate (%) 1990-2002	% of population living below 1USD a day 1990-2001	Life expectancy at birth in years (2002)
Sub-Saharan Africa	174	106	460	0.4	50	46
South Asia	97	70	461	3.6	32	63
East Asia and Pacific	43	33	1,232	6.3	14	69
Industrialised Countries	07	05	26,214	1.8	-	78
Developing Countries	90	62	1,154	3.6	23	62
World	82	56	5,073	2.1	21	63

Source: UNICEF, (2004)

Africa's development crisis has attracted varied responses from various international agencies at different levels (Mbatia, 2011), such as the Structural Adjustment Programs (SAP), which were sponsored by the World Bank and the International Monetary Fund in the 1980s. The programmes of the World Bank and the International Monetary Fund were all meant to address the

persistent poverty and impoverishment of people of the developing world and thus, were geared towards economic development (Zander & Georgsen, 2013).

However, a new concept of sustainable development and human (social) development were conceptualised which emphasised on greater inclusiveness and equity in access to resources as well as greater empowerment of the poor and the marginalised in society aimed at improving their general quality of life (Unwin, 2009 & Mbatia, 2011). This new perspective – the human development approach – informed the formulation of the Millennium Development Goals (MDGs) in 2000 by members of the United Nations and some international agencies.

Despite these and other development initiatives, Africa's development crisis continues unabated (Mbatia, 2011). Many factors have combined to explain the current situation in Africa's development. Among the external factors that have contributed to Africa's current situation include continued dependence of Africa's economies on the outside world; weak bargaining position on the world market resulting in poor terms of trade; economic and political conditions mandated by the International financial institutions (such as the World Bank and the IMF) that distort local monetary and fiscal policies, and over-reliance on foreign advisors who do not fully understand the local environment and who may not have serious commitment to solve Africa's development problems (Mbatia, 2011). There are also external factors that have contributed to Africa's development problems. These include poor governance resulting in the misuse and underutilisation of resources; weak or inappropriate economic policies to protect local interests or industries vis-à-vis the stiff international competition coming from globalisation of the international trade; widespread corruption especially among the ruling elites; political conflicts based on ethnic differences and weak structures to support and sustain the adoption of modern technologies (e.g. ICT) leading to what is termed as the digital divide (Mbatia, 2011).

2.4.3 Some perspectives on the application of ICT in Africa

The world has been transformed into a global village through the application of ICT. The economically powerful nations of North America and Europe have excelled in the application of ICT and have thus, strengthened their position on the global system. However, whilst these powerful nations have adopted ICT to propel their economic and human developmental needs, most developing countries have had limited success in the application of ICT. The good news is that most developing countries now see ICT integration in their economies as a useful strategy for their

own advancement and economic growth and are now putting up efforts to bridge the gap of what has been termed as the "digital divide" (Chandra & Chandra, 2013).

In the context of development, ICT application has been documented to have tremendous impact in developing countries. Through the use of ICT (Internet) the developing countries are provided an opportunity to participate effectively in the new global information society. For example, within the education sector, the use of the Internet facilitates access to information (teaching and learning materials) beyond the national boundaries by both students and lecturers since there exists a strong link between adoption of ICT and education (Mbatia, 2011). ICT could also be applied to improve access to and quality of education – especially among the marginalised groups like women and girls to gain education and technical skills required for them to participate equally in the information and technological economy (Morrell et al, 2007). Secondly, Brunello et al, (2007) posit that ICT has exposed African people to new experiences and practices, which continue to influence their socio-political and economic organisations. This has resulted in the production of a new class of well-informed and knowledgeable citizens who are thus, empowered to actively participate in decision making at all levels in addition to improved productivity in various sectors of African economies (Mbatia, 2011).

2.4.4 The prospects of ICT in improving the education sector in Africa

Information and Communications Technologies (ICTs) consist of the hardware, software, networks, and media for collection, storage, processing, transmission and presentation of information (voice, data, text, images), as well as related services (Sarkar, 2012). ICTs can be divided into two components, namely, Information and Communication Infrastructure which can be referred to as the physical telecommunications systems and networks (cellular, broadcast, cable, satellite, postal) and the services that utilise those (Internet, voice, e-mail, radio and television), and Information Technology (IT) which refers to the hardware and software of information collection, storage, processing and presentation (Sarkar, 2012).

The need to apply ICTs in Africa in the educational sector has the prospect to help increase access to education; improve the quality of teaching and learning and improve the efficiency of administration and management (Mbatia, 2011). These prospects that ICTs offer are among a report submitted by the Partnership for Higher Education in Africa (PHEA) comprising Carnegie Corporation of New York, the Ford Foundation, the William and Flora Hewlett Foundation, the

John D. and Catherine T. MacArthur Foundation, the Andrew W. Mellon Foundation and the Rockefeller Foundation in 2007.

PHEA convened an Educational Technology think tank for Africa with the mandate to help guide the partnership's educational technology initiative by charging the experts to provide intellectual input regarding possible strategies for supporting the innovative application of technology for the improvement of teaching and learning in Egypt, Ghana, Kenya, Madagascar, Mozambique, Nigeria, South Africa, Tanzania and Uganda where the partnership works (PHEA, 2007). The think tank considered the status of ICT across various sectors within each country but with a special focus on the status of ICT in higher education.

Various policies have been couched to support the deployment of ICT in tertiary education to support teaching and learning in many African countries. The enactment of these national ICT policies in the African countries has impacted positively on the liberalisation of the market with regards to access to technological equipment and this has lowered tariffs for ICT hardware and software (USAID, 2014). In Ghana, for example, the government, through the National ICT Policy and Plan Development committee of the Ministry of Communications, formulated an ICT policy – Information and Communication Technology for Accelerated Development (ICT4AD), a foundation policy upon which Ghana's vision for the information age has been built. The deployment and exploitation of ICTs in education are among the policy goals.

Ghana's ICT4AD has among its sub-visions, a transformation of the educational system to provide the requisite educational, and training services and environment capable of producing the right types of skills and human resources required for developing and driving Ghana's information and knowledge-based economy and society. Among the specific objectives of the policy statement is the promotion and encouragement of distance education, including electronic distance education and virtual learning, focusing on tertiary level education and training in all fields and disciplines to broaden access to educational and training resources and services for a larger section of society. Secondly, at the institutional level, Nafukho (2007) notes an exemplary ICT policy that has been set up at the University of Dar es Salaam in Tanzania and Makerere University in Uganda. This has led to a clear institutional policy on e-learning, investment in infrastructure and capacity building especially training of teachers and students (Nafukho, 2007).

In the area of ICT and pedagogy, the PHEA think tank notes that some of the universities in Africa offer some e-learning content on universities' websites for both degree and diploma courses. In South Africa for example, the report notes the successful implementation of e-learning by the

University of South Africa (UNISA) for distance education. In Kenya, e-learning is reported to cover activities from supported learning to blended learning (the combination of traditional and e-learning practices) and learning that is entirely online (PHEA, 2007). E-learning in Kenya is often used in distance learning programmes whereby it is offered through the use of electronic media such as CD-ROMs, mobile phones, video-conferencing, e-mails, websites interactive TV and satellite broadcasts (PHEA, 2007).

In the area of technology infrastructure and connectivity, the PHEA think tank observes that much attention is and has been given to improving ICT infrastructure within higher education institutions across the continent. Ghana, for example, became the second country in sub-Saharan Africa to have full Internet connectivity via the world's first submarine fibre-optic cable system, South Atlantic 3/West Africa Submarine Cable/South Africa Far East (SAT-3/WASC/SAFE), which links Africa to Europe and Asia in August 1995. In view of this, there has been substantial improvement in the telecommunication infrastructure, and Ghana's teledensity increased by 1,200% over the period 2001-2006. These provisions have helped the tertiary institutions to have much wider access to the use of the Internet and its array of services.

2.4.5 Some challenges in the use of ICT in higher education in Africa

The prevalence of new technologies, especially digital media, social collaboration, management systems and assessment technology is changing the world of higher education (USAID, 2014). Research indicates that, the traditional lecture approach is giving way in many classrooms to a hybrid model where physical gatherings are supplemented by online content, discussions and activities in most United States institutions (USAID, 2014). However, when it comes to the use of ICT in higher education in Africa, there are a few challenges that need to be considered and addressed.

Appropriate curriculum development process which is guided by a clear ICT policy is required, if there is going to be any success of e-learning programmes in Africa's institutions of higher learning (Nafukho, 2007). In order to improve technological literacy, the United States, for example has enacted a clear policy on the role of technology in education, whereby the Department of Education provides technology assistance to schools in a variety of ways that enables teachers to use and teach with technology (Nafukho, 2007). However, on the African scene, there exists an absence of an overall technology plan, coupled with short-term funding models and the lack of clear

acquisition and replacement plan, which has resulted in an inconsistent and unproductive approach to ICT implementation (PHEA, 2007).

In the area of pedagogy and the use of ICTs, research shows that many higher educational institutions in Africa "are struggling with the issue of recognised and accepted paradigms of e-learning that are not only pedagogically sound but also appropriate to their context. This struggle is often linked to the absence of e-learning strategies for organising the educational process, including defining the objective, components and mechanisms necessary for implementation" (PHEA, 2007: ix). For example, the setting up of the Egyptian Universities Network (EUN) was meant to facilitate the development of "local content" for 17 universities in Egypt. However, available reports show that there are no appropriate research material, library catalogues and learning media that are relevant to the needs of the country on the EUN (PHEA, 2007).

Additionally, most governments which fund higher education institutions in Africa focus their attention on e-learning programmes on primary and secondary education. As such funding for e-learning programmes in tertiary institutions becomes inadequate (Nafukho, 2007). Where the universities have the desire to offer e-learning content, similar challenges to the use of innovative teaching and learning strategies with ICT occur in the African higher educational institutions. These challenges include large numbers of students per lecturer; high staff workloads, resulting in limited time for teaching; limited acquaintance with new teaching technologies and resultant low-level administrative acceptance of these strategies as appropriate for learning; limited financial resources available to acquire the relevant teaching aids; and limited space and facilities for accomplishing the intended changes (PHEA, 2007).

Last but not least, while there is an improvement of ICT infrastructure (satellite, video conferencing facilities or virtual classrooms) within higher education on the African continent, these technologies are not widely used in higher education (PHEA, 2007). In addition to the fact that most lecturers and students in these tertiary institutions are not computer literate, and therefore do not use the Internet (see Table 2-2) most tertiary institutions lack a supportive technical support team to drive the ICT idea (Mbatia, 2011).

Table 2-2: Internet usage and population statistics for Africa and the world, 2012

	Population (2012 est.)	Pop. % of world	Internet users (30/6/2012)	Penetration (% pop.)	Internet % users	Facebook (31/12/2012)
Africa	1,073,380,925	15.3 %	167,335,676	15.6 %	7.0 %	51,612,460
Rest of world	5,944,465,997	84.7 %	2,238,182,700	37.7 %	93.0 %	924,331,500
World total	**7,017,846,922**	**100.0%**	**2,405,518,376**	**34.3 %**	**100.0%**	**975,943,960**

Source: (Miniwatts Marketing Group, 2013)

In sum, in order to take up the opportunities that ICTs present at the higher educational sector in Africa, political challenges such as the absence of educational policies that address the role of the ICT sector and tax policies and laws that affect the cost of technology should be addressed. Secondly, the tendency to use technology experts and not pedagogical experts in designing and developing ICT implementation plans should be looked at (USAID, 2014). Additionally, African higher educational institutions should address the challenges of "absence of platforms for experimentation by educators; capacity challenges such as absence of ICT capacity (especially ICT for education capacity) and lack of professional development opportunities for educators on educational technology use" (USAID, 2014:102).

2.4.6 Benefits of application of ICTs in Africa's higher education

New and effective ways of teaching and learning for many students are being led by recent technologies. These new technologies can provide the potential to make significant positive changes to the quality of teaching, learning and access to education. For example, the use of ICT in higher education can facilitate a transition of the role of the teacher in the classroom into that of an instructional manager, helping to guide students through individualised learning pathways, identifying relevant learning resources, creating collaborative learning opportunities, and providing insight and support both during formal class time and outside of contact time (Souter, Adam, Butcher, Sibthorpe, & Tusubira, 2012)

The use of ICTs in Africa's higher education sector can result in increased access to useful instructional materials. In view of the acute shortage of updated reading and instructional materials as well as lack of effective information management systems at most libraries in Africa, the use of ICTs such as the Internet will enable researchers, students and lecturers access and share as equal partners the existing information on the global networks (Mbatia, 2011). In the case of harnessing online digital learning resources to promote higher education on the continent, mention can be made of the exemplary role of Mindset Network and Siyavula Project in South Africa where high quality online digital materials have been developed and shared through an open licence agreement

for teaching and learning for both students and teachers (Souter, Adam, Butcher, Sibthorpe, & Tusubira, 2012).

When lecturers are able to access and use valuable instructional materials online, such materials would help to improve the quality of teaching and learning in these African tertiary institutions. These quality teaching and learning materials would serve to empower the lecturers (Darkwa & Mazibuko, 2000). In the same vein, the students' quality of education would improve since they would be able to obtain more information to supplement what they learn in class by accessing various sources of information.

Interactions between lecturers and students are reported to enhance effective teaching and learning (Mbatia, 2011). In African tertiary institutions where large students' numbers make lecturer-students interactions less frequent, ICTs can be used to facilitate the interactions between students and lecturers. For example, the students would be able to engage in effective class discussions without meeting physically through the formation of discussion groups using the e-mail system and discussion forums that can be set up online. This way, enhancing effective teaching and learning in African tertiary institutions can be achieved through the adoption of the interactive capabilities that ICTs offer (Mbatia, 2011).

Through the use of modern teaching technologies offered by ICTs such as PowerPoint presentations, lecturers are able to improve the learning moods of the students thereby making their instructions more lively and effective (Darkwa & Mazibuko, 2000; Mbatia, 2011). Again when lecturers deliver their lessons through the use of modern ICTs that utilize audio visual media, students become more attentive to follow the lesson and therefore, instructional objectives are achieved (Mbatia, 2011). Consequently, the traditional "dry lecture method" that has been practised by most lecturers in Africa's tertiary institutions could be replaced by the use of modern ICTs (Mohamedbhai, 2008).

In sum, the future of higher education in Africa is likely to see much more intense use of ICTs in higher education combined with more "traditional" approaches to teaching and learning. This stems from the recent reports that suggest that ICTs offer the potential to make significant positive changes to the quality of teaching and access to education on the continent (USAID, 2014). However, since most African higher educational institutions find themselves increasingly resource-constrained to engage in fully online teaching and learning, suggestions have been made for these higher educational institutions to think creatively about how to modify e-learning to fit current technological constraints facing most countries of the continent (USAID, 2014). In the considered

recommendation for action of the report submitted by the United States Agency for International Aid on "African Higher Education: Opportunities for Transformative Change for Sustainable Development" blended learning has been suggested as "more effective than either fully online or traditional lecture-based approaches" (USAID, 2014:103) For institutional needs, blended learning environments have been suggested to help compensate for limited classroom space available in most African higher educational institutions. Secondly, the use of blended learning environments for entry level courses where students' numbers are normally very high, could result in the provision of quality course materials while allowing for faculty resources to be reallocated to higher level classes. Furthermore, the faculty are disposed to using new teaching technologies and approaches which ultimately affects both quality and access to higher education. For the students who enrol in these African higher educational institutions, blended learning environments have been suggested to offer them flexibility of online learning combined with the social and instructional interactions that the traditional face-to-face teaching approach offers.

2.5 Blended learning environment and Communication Skills development

> "New learning has to be designed and needs more careful study. Changing educational practice has to be an engineered approach, in which goals change as a function of the scenario users are engaged in" (Andriessen, 2006:316).

Wilson (1995) describes a learning environment of consisting of the learner, a setting or space where the learner uses tools and devices to collect, interpret and interact with other learners and teachers. This description presupposes a degree of student initiative and choice for effective learning to take place. With increasing demand on students to explore more in order to achieve their potential, a learning environment that facilitates the determination of their goals and learningactivities seems an attractive concept (Wilson, 1995). However, much as educators would like their students to choose their learning activities and control the pace and direction of their learning, the provision of proper support, guidance and rich resources of tools to guide and support knowledge and skills acquisition in such learning environment is vital. In sum, educators and learning designers might not want to be driven to an 'open learning environment' that is not well-designed and supported in order to avoid chaos and entropy (Wilson, 1995).

The increasing accessibility, affordability and capability of the Internet and the array of rich technological tools it provides has created enormous possibilities in designing, developing and

implementing innovative learning environments(Chandra & Fisher, 2009). The Internet and its technological tools have been recognised as offering interactive and engaged learning experiences by connecting learners to their teachers and to other learners (Garrison & Vaughan, 2008). This innovative learning environment has been corroborated by research findings that prove that interactive and collaborative learning experiences are more congruent with achieving higher-order learning outcomes (Palloff & Pratt, 2005).

In the research of CS, Long, (1996) maintains that learners are most likely to notice linguistic form during interaction. Hegelheimer & Chapelle, (2000) also argued that interactions facilitate learners' comprehension of the semantics and syntax of input and improve the comprehensibility of their own linguistic output whilst Gonzalez-Lloret (2003) concluded that interaction facilitates comprehension better than learning conditions without interactions Evidence from literature on Second Language Acquisition (SLA) also proves that the active interaction of learners with native speakers or other learners of the target language has proven to be fundamental to the learning process, as it provides opportunities for students' engagement in negotiation of meaning (Strambi & Bouvet, 2003).

The need to provide more engaged learning experience is at the core of the interest in blended learning (Garrison & Vaughan, 2008). The core principle of blended learning is the optimal integration of the traditional face-to-face teaching and learning system and online or distributed learning system such that the blend of each other's strength provides a unique learning experience that suits the context and intended educational purpose (Garrison & Vaughan, 2008). Earlier, in this study, the use ICT in the teaching and learning of CS has been identified. The following section of the study will however, examine the offerings of blended learning environment and the development of Communication Skills in higher education.

2.5.1 Blended learning – A definition

There is much wisdom for lecturers to assist their students in their learning, yet it has been proven that students encounter more meaningful language learning experience when they perform tasks on their own (Nunan, 2004). The term, blended learning therefore is the description of the effort to bring the best sides of the face-to-face and ICT-mediated teaching and learning environments together. Driscoll (2002) identified four different concepts of blended learning:

(i) The combination mix modes of Web-based technology such as live virtual classroom, self-paced instruction, collaborative learning, streaming video, audio, and text to accomplish an educational goal

(ii) The combination of different pedagogical approaches for example, constructivism, behaviourism, cognitivism to achieve optimum learning outcome with or without instructional technology

(iii) The combination of various instructional technology such as videotape, CD-ROM, Web-based training, film with the traditional face-to-face instructor led teaching and learning

(iv) The combination of instructional technology with actual job tasks in order to harmonize learning and working

According to Graham (2006) a look at the first two concepts presents some challenges. Firstly, they are composed of practically all learning systems. For example, if in a teaching and learning environment, a teacher uses a feature of behaviourist teaching and constructivist learning approach, this could be termed as blended learning. Secondly, if a teacher uses any technology in their teaching and eventually asks the students to present their assignment by e-mail this scenario also constitute a blended learning in the concepts described above.

In order to avoid the ambiguities presented in the concepts above, (Osguthorpe & Graham, 2003), define blended learning as the combination of face-to-face with distance delivery systems. This involves the use of the Internet with the technologies supporting more functionalities than displaying a page from a Web site on the classroom screen. The emphasis remains the teaching methodologies that facilitate pedagogical changes to respond to the unique needs of learners. Adopting blended learning environments is a strategy to maximize the benefits of both face-to-face and online methods for teaching and learning

Similarly, Singh & Reed (2001) embedded their definition in some principles which could result in radical improvements in the effectiveness, scope and cost-effectiveness of learning programs relative to traditional face-to-face approaches. In their view, blended learning focuses on optimizing the achievement of learning objectives by applying the right learning technologies to match the right personal learning style to transfer the right skills to the right person at the right time. This description corroborates Orey's (2002) views of blended learning from the teacher's and the learner's perspectives. From the teacher's perspective, blended learning is described as the organisation and distribution of all available facilities, technology, media and materials to achieve an instructional goal, even when many of these things may considerably overlap providing learning

experiences to achieve their individual learning goals to match their preferred learning style (Orey, 2002).

Graham & Allen (2009) then provides a summation of these plethora of definitions by describing blended learning as the combination of instruction, both methods and delivery media from two archetypal learning environments, the traditional face-to-face learning environment and a ICT-mediated or e-learning environment. This is the preferred working definition of blended learning environment for this research since it captures all the relevant issues being considered in this study.

2.5.2 Dimensions of Blended Learning

Various studies and reports have provided various dimensions of blended learning. For example, the report to the Higher Education Academy in the UK provides various dimensions of blended learning.

First of all, the blending of the delivery mode, technologies and chronology consists of learning programmes that blend distance and face-to-face modes using technologies to enable flexible scheduling (Sharpe, Benfield, Roberts, & Francis, 2006; Jung & Suzuki, 2006 & Lee & Im, 2006). In this dimension of blended learning, the students experience primarily the traditional face-to-face teaching and learning while having access to a large amount of online resources as a supplement. The learning environment remains institution and teacher-centred. However, the virtual learning environment is used as a repository for and a means of transmitting content to the students. Therefore, the students are able to revisit items which may have been presented at times inconvenient to them and thereby enjoy some form of flexibility in their time scheduling (Graham, 2006; Sharpe, et al, 2006).

The locus dimension of blended learning supports students with authentic practice-based settings often referred to as problem or project-based which are more effective learning environments than the abstracted and more theoretical classroom-based settings (Sharpe, et al 2006; Goodyear & Ellis, 2010, Kolmos, 2010 & Savin-Baden, 2003). A number of Universities are utilizing the authentic problem-based learning as the locus dimension of blended learning at various levels of study; the notable ones being Aalborg university (Ryberg & Dirckinck-Holmfeld, 2010) and the University of Phoenix's School of Advanced Studies (Lindquist, 2006).

The role dimension also facilitates the harnessing of various strengths of cross-functional teams. The design, development and facilitation of learning programmes which are traditionally the

preserve of the teacher is opened up to learning technologists and administrators to play a more active role (Sharpe, Benfield, Roberts, & Francis, 2006).

The pedagogical dimension of blended learning is credited with the provision of the environment where students prefer a more active, problem-based learning approach where derivation and assimilation of theories are achieved in practical context, and they learn best from peer-to-peer formative assessment (Sharpe, Benfield, Roberts, & Francis, 2006). The pedagogical dimension also enhances the opportunities to develop a community of practice because it is adaptable to the engagement of the students, while at the same time creating interdependencies among them (Dirckinck-Holmfeld, et al., 2009).

The focus dimension according to Kaur & Ahmed (2006) is exemplified in the experience of the Open University of Malaysia (OUM) where several telecommunications companies, computer and software manufacturers, and financial institutions have come together to provide the students with attractive and affordable computer packages bundled with the right software and relatively inexpensive broadband access. The focus of this approach is to enable the OUM to champion democratization of education to eliminate exclusivity.

Maisie (2006) posits that human beings, being as complex as we are, we do not learn in a simple or uniform manner. Consequently, the direction dimension of blended learning recognises the importance of giving the students equal status in the shaping of their own learning. Indeed, (Fulantelli, 2009) emphasizes on the sharing and shaping of ideas, as a community of learners develop among the students, progressively leading to a formation of community of practice in blended e-learning.

The literature of various dimensions of blended learning enumerated above has been reviewed and the relevant categories have been adopted to suit this study. For instance, face-to-face delivery of instruction, web-based technologies and CMC interventions are applied in this study to allow flexible scheduling for the students. Additionally, the expertise of technologists and web designers facilitated the design of the blended learning environment, thus fulfilling the role dimension of the blended learning. Furthermore, the inclusion of task and activities as well as regular assessment practices fulfilled the pedagogical dimensions of this study.

2.5.3 Models of Blended Learning

A model can be described as a simplified version of a concept, phenomenon, a system or an aspect of a real world. The objective of using a model may be either to aid decision-making by

simulating 'what-if' scenarios or to explain, control, and predict events based on past observations. Sharpe, Benfield, Roberts, & Francis (2006) offer three models of blended learning. These include:

(i) *The provision of online supplementary resources* - this model of blended learning incorporates the provision of supplementary online resources for learning programmes conducted along predominantly traditional lines with institutionally supported virtual learning environments (VLEs). Often referred to as transmissive pedagogy, teaching and learning takes place in the traditional face-to-face ways through lectures and seminars, but provide extra support to the students through placing lecture notes on the web.

(ii) *Transformative course level practices underpinned by radical course designs* - This model shifts emphasis from the VLE to extensive utilization of other available technologies to enhance and even change the students' mode of interaction, studying and learning. Referred to as transformative model, it transforms teaching and learning environment from where learners are just recipients of knowledge to where learners are actively involved in the construction of knowledge through dynamic interactions. This type of blend promotes intellectual activity that is practically impossible without the use of technology (Graham, 2006).The transformative model is currently on the ascendancy in higher education and is often developed from the application of the principles of constructive alignment where assessment strategies are constructively aligned with the learning objectives of the course (Biggs, 2003).

A holistic view of technology use to support learning – This is a newer characterisation of blended learning where most learners do not distinguish between learning with or without technology and therefore, faculty encourage the use of the learners' own technologies such as mobile phones, online communities and instant messaging to support the students' learning at any place and at any time (Sharpe, Benfield, Roberts, & Francis, 2006).

This study therefore, makes a case for the utilization of the transformative course level practices as explicated in the literature above for blended learning initiatives in the teaching and learning of CS in the tertiary institutions.

2.5.4 Blended learning environments teaching and learning CS

The findings of Kocoglu, Ozek, & Kesli, (2011) from a quasi-experimental study confirmed position held by advocates that the blended learning environment is as useful and as effective as face to face courses, but contradicted the reported superiority of blended learning environment over traditional face to face in terms of student learning. Secondly, Stracke, (2007) in a study to

understand the reasons behind those students' decision to leave the blended language learning program midstream identified among other issues a perception of lack of support and connection and complementarity between the face-to-face and computer-assisted components of the blend; a perceived lack of usage of the paper medium for reading and writing; and the rejection of the computer as a medium of language learning. This proves the assertion that the differing views, beliefs and attitudes of students are an integral part of any learner-centred approach and must be considered in the introduction of an innovative educational environment.

Indeed, in outlining the design procedures for blended learning, Huang & Zhou, (2006) present us a carefully designed procedure which is very relevant to the two research findings outlined above as well as the current research study. This is because an effective blended learning environment uses ideas from a learning design approach that looks at the learning goals and aligns them with teaching and learning activities and assessment, thereby, ensuring the integration and appropriate use of technology (Lefoe & Hedberg, 2006). Huang & Zhou's design procedures have three main stages, namely:

(i) pre-analysis – this involves regular assessment of learner's prior knowledge, learning styles, and strategies; content analysis of the curriculum according to the criteria of taxonomy of educational objectives and activity design; and environmental features analysis;

(ii) activity and resource design – this focuses on the teacher's instructional methods for organising course events and activities and also the basic principles for curriculum assessment;

(iii) Instructional assessment – which normally depends on the activity objectives, performance definitions and the general environment of blended learning (Huang & Zhou, 2006).

In the area of research on blended learning and CS, not much has been documented to date.

However, (Harker & Koutsantoni, 2005) present a classic case study in which effectiveness of a web-based learning programme of CS for British students from ethnic minority backgrounds was assessed. The study aims at investigating which mode of delivery - distance learning vis-à-vis blended learning, is more effective in terms of student retention, achievement levels and satisfaction with the programme. The conclusion was that the blended learning mode has proven to be more effective in student retention than the distance learning mode on the CS course. Students' achievement and satisfaction with the course did not, however, show any great difference between groups.

2.6 Summary and research position

This chapter has presented a review of CS teaching and learning in the context of new learning technologies to illustrate how these new technologies offer an enormous potential to influence and transform CS learning for higher education. In this research project the design and implementation of a blended learning environment was influenced by this desire to demonstrate the blending of modern information and communication technology tools with the traditional face to face learning environment to enhance and transform the teaching and learning of Communication Skills learning for higher education.

This literature review has also shown that although considerable research and development have taken place in recent years in terms of developing web-based interactive systems to teach languages in a range of contexts, the teaching of CS for higher education has remained relatively un-researched (Harker & Koutsantoni, 2005). This review found a few research papers on blended learning environment for instance (Harker & Koutsantoni,, 2005) focusing on the teaching of CS in higher education.

Taken a cue from the approach of Bax (2003) in his exposition of *Integrated CALL*, this research argues for the approach where the content of the CS curriculum is an integrated language and skill development and the students' tasks involve the use of some form of ICT. Students' activities should involve frequent interaction with other students and some interaction with the computer and the lecturer throughout the lesson.

Feedback should involve interpreting, evaluating and commenting that stimulate thought. The teacher's role is that of a facilitator. The technology's position in the curriculum is that of a tool for learning, normally integrated into the syllabus and adapted to learners' needs. This is what (Richards, 2006) refers to as 'communicative language teaching and learning – a CS pedagogy based on activities which include communication between teacher and students and within students' groups in the target language, the use of tasks resembling what happens outside the classroom and the use of listening, speaking, reading and writing skills in the classroom (Badger & Yan, 2008).

This study therefore, makes a case for three distinct propositions based on the literature reviewed to position the research as a contribution of innovative blended learning environment approach to facilitate the improvement of the knowledge and skills of the students in the CS course. These propositions are;

(i) the provision of *comprehensible rich input*(Doughty & Long, 2003; Calabrese & Faiella, 2011), in multiple formats through blended learning environment would sustain the students interest in the CS course and thereby promote their cognitive engagement in the course;

(ii) the provision of ICT tools in the blended learning environment would enhance the students' collaboration and interaction with both peers and lecturers and thereby encourage their motivation in the course which ultimately would enhance their cognitive development in the CS course;

(iii) the provision of learning task and activities with immediate feedback for the students in the blended learning environment would help build the students understanding and use of the concepts in the CS course.

This would be undertaking using a formative experiment research strategy. This would allow this research to be closely linked to the development of CS in higher education and help in exploring and analysing the learning needs of the students in a technology enriched CS teaching and learning. As a result, the current study focuses not only on the design and development of a blended learning environment for CS (Huang & Zhou, 2006) but also on exploring its use by CS students over a period of two research cycles as described in the next chapter on methodology.

Chapter 3

3 The Research Methodology

3.1 Introduction

This research methodology provides the broad principles from which the specific methods or procedures were derived to solve the research problem. The methodology used in this research addresses the research problem systematically with the aim of finding solution to the problem and to draw valid conclusion from the study (Bryman, 2008).

This chapter presents the methodology of the study which focuses on the research design, strategies and the approach used in the data collection and analysis.

3.2 The Research Strategy

A research strategy encapsulates the logic of enquiry and provides the starting point and a number of steps in providing solution to the research problem. Research strategies differ in accordance with the research problem to be addressed (Blaike, 2010). According to Yin, (2003), the common types of research strategies used in the collection and analysis of data to address research problems are experiment, survey, archival analysis, history, and case study.

This study used a formative experiment as the strategy to address the research problems. Bradley & Reinking (2011) describes formative experiments as among a group of closely related research strategies aimed at studying promising interventions in real instructional environments. These closely related approaches are often collectively referred to as design-based research (Bradley & Reinking, 2011a). Design-based research is defined in this study as a systematic but flexible methodology with the aim to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to contextually-sensitive design principles and theories (Wang & Hannafin, 2005).This strategy has also been referred to in varieties of nomenclatures such as *design experiments* (Brown, 1992; Collins, 1992), *design research* (Cobb, 2001; Collins, Joseph, & Bielaczyc, 2004; Edelson, 2002), *development research* (van den Akker, 1999), *developmental research* (Richey & Nelson, 1996; Richey, Klein, & Nelson, 2003), *formative research* (Newman, 1990; Reigeluth & Frick, 1999; Walker, 1992), and *educational design research* (van den Akker, Gravemeijer, McKenney, & Nieveen, 2006; Kelly, Lesh, & Baek, 2008).

All the variants of this research strategy share similar characteristics. They are:

(i) *Pragmatic* – that is, design-based research refines both theory and practice; the value of theory is appraised by the extent to which principles inform and improve practice (Cobb, 2001).

(ii) *grounded* – as well as being theory-driven and grounded in relevant research, theory and practice, design-based research is conducted in real-world settings and the design process is embedded in, and studied through, design-based research (Collins, Joseph, & Bielaczyc, 2004)

(iii) *interactive*, *iterative* and *flexible* – in design-based research, designers are involved in the design processes and work together with participants; processes are iterative cycle of analysis, design, implementation, and redesign; and initial plan is usually insufficiently detailed so that designers can make deliberate changes when necessary (van den Akker, Gravemeijer, McKenney, & Nieveen, 2006; Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003)

(iv) *integrative* – mixed research methods are used to maximise the credibility of on-going research, and that methods vary during different phases, as new needs and issues emerge and the focus of the research evolves; rigor is purposely maintained and discipline applied, appropriate to the development phase (Kelly, Lesh, & Baek, 2008);

(v) *contextual* - that is, the research process, research findings, and changes from the initial plan are documented; research results are connected with the design process and the setting; the content and depth of generated design principles varies, and guidance for applying generated principles is needed (Wang & Hannafin, 2005).

Even though, design-based research is relatively new, it has been established in the research literature as a means to develop, test, and refine pedagogical theory and to align research more closely to instructional practice (Hoadley, 2004). Formative experiment, a variant of design-based research, has been adopted by a number of literacy researchers to address more directly the questions and issues that practitioners face and that are not addressed as authentically or as directly by other research methodologies (Bradley & Reinking, 2011). Among such questions are:

(i) How, instructors or teachers should systematically create, test, and disseminate teaching and learning interventions that will have maximum impact on practice and will contribute significantly to theory (Bannan-Ritland, 2003)

(ii) How do the theoretical underpinnings of the intervention stand up to actual classroom practice? What factors enhance or inhibit the intervention's effectiveness and how might the intervention be modified accordingly (thus the terms *formative* and *design*)?

(iii) Does implementing the intervention reveal the need to modify existing theory or to create new theory?

(iv) What unexpected collateral effects might the intervention precipitate?" (Reinking & Bradley, 2008).

In providing answers to such questions, Newman (1990) argues that in formative experiments the researcher first sets a pedagogical goal and finds out what it takes in terms of material, organisation, or changes in the technology to reach the goal.

It is therefore argued in this study that these enumerated questions above and the subsequent answer that has been provided by (Newman, 1990), justifies the adoption of formative experiment as a strategy for this research. Additionally, formative experiments have been used to study:

(i) the use of computers to affect reading and writing (Reinking & Pickle, 1993),

(ii) the effectiveness of cognitive strategy instruction for Latina/o readers (Jiménez, 1997),

(iii) the improvement of reading comprehension through explicit strategy instruction (De Corte, Verschaffel, & Van de Ven, 2001)

(iv) the enhancement of independent reading with multimedia book reviews (Reinking & Watkins, 2000)

(v) engagement in reading of beginning English language learners (Ivey & Broaddus, 2007),

(vi) vocabulary learning (Baumann, Ware, & Edwards, 2007),

(vii) the potential of Internet software to support early reading of first graders at risk for reading difficulties (Englert, Zhao, Collings, & Romig, 2005) and

(viii) a technology-supported intervention designed to foster the development of emergent reading and writing skills in four and five year old children (McKenney & Voogt, 2009).

The strength of formative experiments is evidenced in, especially how these researchers take multiple, interacting variables into account as a means of managing the complexity of classrooms rather than trying to control them statistically or through experimental designs (Tracy, 2009). Research in formative experiment approaches has also proven that when researchers take on board the complex nature of the classroom situation they are investigating, it promotes a better understanding of whether an intervention is effective and feasible and in what context allows both researchers and teachers to work through problems that arise during a study to meet the needs of their students (Tracy, 2009). Formative experiments allow for inquiry and investigation using mixed

methods which involves the connection, integration or linking of both qualitative and quantitative strands (Fisher, Frey, & Lapp, 2009; Creswell, 2010).

However, a number of limitations and methodological issues have been associated with formative experiments (Dede, 2004). Dede (2004) raises among other methodological issues, the large qualitative and quantitative data of various types that are collected on many different participants and which he argues, could raise substantial problems of alignment, coordination, and analysis in formative experiments. However Dede (2004) acknowledges that the effort of formative experiments has produced valid and valuable findings through the use of elegant collection and analysis strategies of the various data that are collected in such research strategies.

Formative experiments have therefore, been used in mainstream education research and among classroom researchers. Bradley & Reinking (2011) argue that the international appeal of this research strategy has resulted in three highly regarded research journals, *Educational Researcher* (2003, Vol. 32, No 1), *Educational Psychologist* (2004, Vol. 39, No 4) and the *Journal of Learning Sciences* (2004, Vol. 13, No 1), devoting themed issues to formative and design experiment research.

Additionally the following edited books have been devoted to the research strategy: *Educational Design Research* (van den Akker, Gravemeijer, McKenney, & Nieveen, 2006),*Handbook of Design Research in Education: Innovations in Science, Technology, Engineering, and Mathematics Learning and Teaching* (Kelly, Lesh, & Baek, 2008), *On Formative and Design Experiments: Approaches to Language and Literacy Research* (Reinking & Bradley, 2008) and *Conducting Educational Design Research* (McKenney & Reeves, 2012)

A number of models and frameworks for the performance of formative experiment has been developed (McKenney & Reeves, 2012). These models and frameworks contribute to important methodological perspectives and possibilities for conducting formative experiments (Reinking & Bradley, 2008).

First, the Interactive Learning Design (ILD) framework proposed by (Bannan-Ritland, 2003) has been used to investigate the implementation of online support for teachers, tutors and parents in order to foster collaborative reading with children who have disabilities (Bannan-Ritland, 2002).

The integrative learning design framework consisted of four broad phases (see figure 3.1). These phases are: *Informed Exploration*, *Enactment*, *Evaluation – Local Impact*, and *Evaluation – Broader Impact respectively*. Bannan-Ritland (2003) postulates that the ILD process is not intended to be a description of a single study in which an intervention is designed in a relatively short space of time and then tested and disseminated. The ILD framework aims at the creation of products, artefacts, or

processes that leverage learning and teaching by making insights usable, actionable, and adoptable (Bannan-Ritland, 2003).

By drawing on a myriad of established research methodologies, the ILD framework for formative experiment attempts to move past isolated, individual efforts of design research by articulating a logically ordered, but dynamic frame that considers both field studies and experimental research methodologies in advancing the systemic impact of research across a variety of domains and social settings (Bannan-Ritland, 2003).

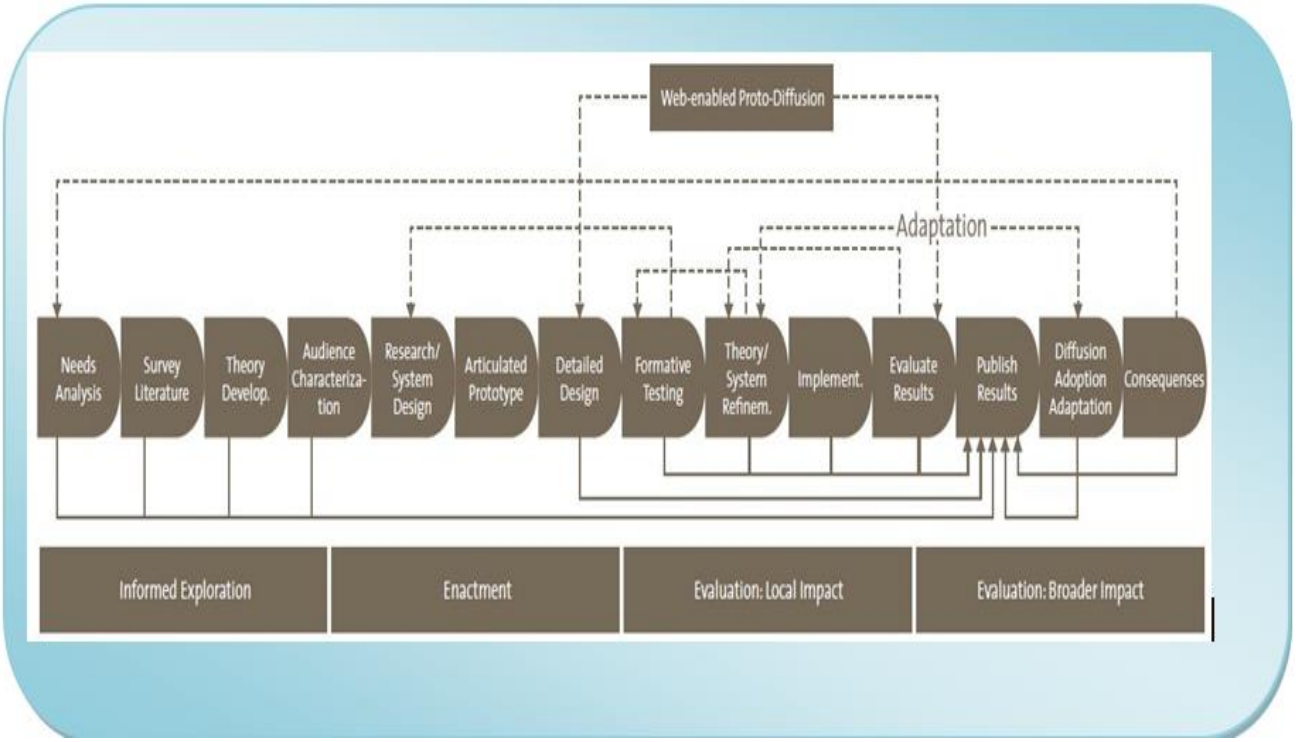

Figure 3-1: Bannan-Ritland's Integrative Learning Design framework (Bannan-Ritland, 2003)

Reeves (2000) proposed a similar model for the conduct of formative or design experiment. The model comprises of four key stages namely; *Analysis of practical problems by researchers and practitioners*, *Development of solutions with a theoretical framework*, *Evaluation of testing of solutions in practice*, and *Documentation and reflection to produce design principles* (see figure 3.2).

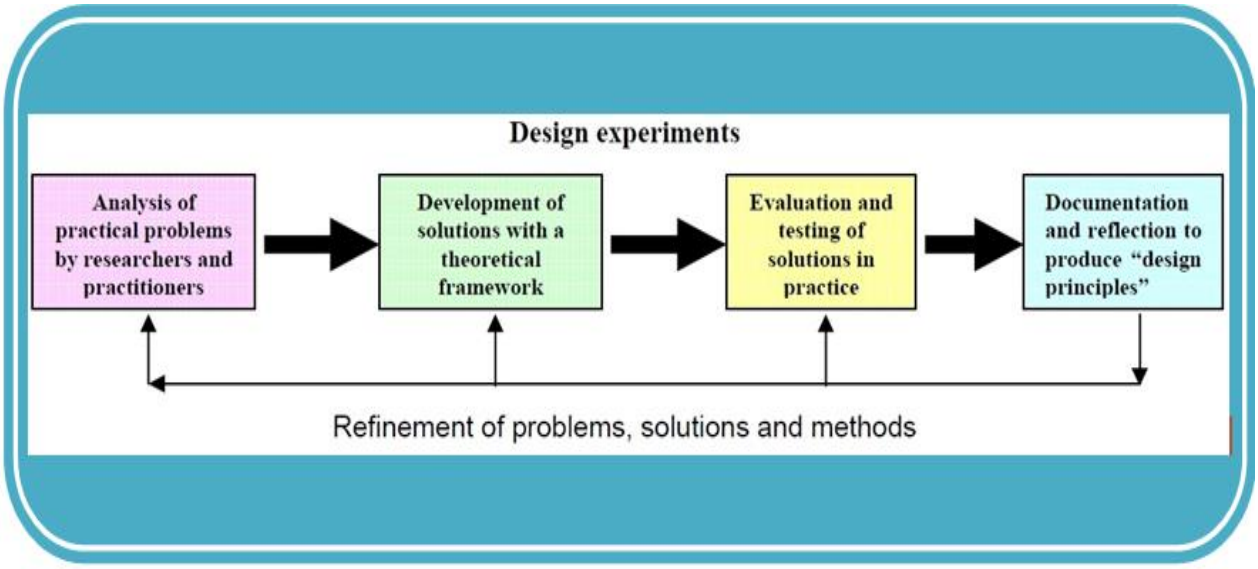

Figure 3-2 : Design experiment diagram (Reeves, 2000)

In comparison with traditional empirical research approach, the primary advantages of (Reeves, 2000) framework for formative or design experiment are its requirements for practitioners and researchers to collaborate in the identification of real teaching and learning needs, the development of prototype solutions based on existing design principles, and the testing and refinement of both the prototype solutions and the design principles until satisfactory outcomes have been reached by all stakeholders(Reeves, 2006). Reeves (2000) thus concludes that, the paramount research goal of education technology should be solving teaching, learning and performance problems, and deriving design principles that can inform future development and implementation decisions. This calls for the creation of design knowledge in educational research since educational technology is a design field (Reeves, 2006).

McKenney & Reeves (2012) recently argued for a generic model for conducting formative and design experiment research in education. Their proposed model is presented in figure 3.3 on the next page.

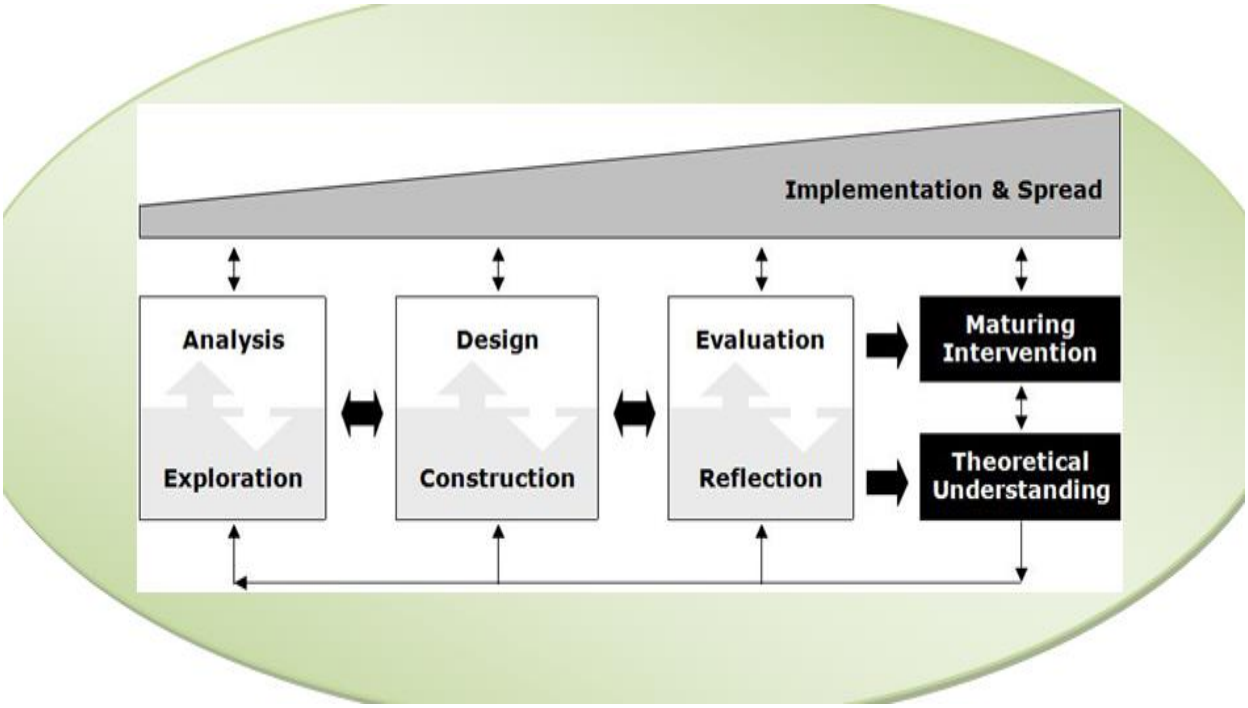

Figure 3-3: Generic model for conducting design research in education (McKenney & Reeves, 2012)

The essential elements of the proposed model for the conduct of educational design research are:

(i) Three core phases in flexible, iterative structure: *investigation/analysis; design/prototyping; evaluation/retrospection.* Here, the authors explain that the squares in the model represent the three core phases. The arrows between the different elements indicate that the process is iterative and flexible in that while some general flow is indicated, many different pathways could be taken.

(ii) Dual focus on theory and practice; *integrated research and design processes; theoretical and practical outcomes.* The dual focus on theory and practice is made explicit through the rectangles, which represent the scientific and practical outputs, respectively. The model shows a single, integrated, research and design process.

(iii) Indications of being use-inspired; *planning for implementation and spread; interaction with practice; contextually responsive.* Here, the model offers indications of being use-inspired. The trapezoid represents implementation and spread, showing that interaction with practice is present from the start, and that the scope increases over time. The bi-directional arrows indicate that what

happens in practice influences both the on-going core processes and ultimate outputs (thus being contextually responsive), and vice versa (McKenney & Reeves, 2012).

3.3 Proposed formative experiment model for the study

The aim of this research study was to test the effectiveness of a blended learning environment for the teaching and learning of CS in tertiary institution using formative experiment as a research strategy. This therefore required the design and testing of a blended learning environment named ABLECAT for the improvement in the knowledge and skills of undergraduate students in a CS course. The formative experiment model used is an adaptation of Reinking & Watkins' (2000) framework for conceptualizing, conducting and reporting a formative experiment.

The iterative formative experiment framework for this research as presented in figure 3.4 below involves the six core steps.

(i) The identification of the pedagogical goal of the experiment, and the establishment of the relevant pedagogical theory of its value to the research.

(ii) The second step involved the development of an instructional intervention that has potential to achieve the identified pedagogical goal. This intervention which utilizes blended learning environment was named ABLECAT using the Moodle platform.

(iii) The first cycle implementation of the intervention was evaluated to identify the factors enhancing or inhibiting the effectiveness of the ABLECAT in achieving the pedagogical goal.

(iv) The identified enhancing and inhibiting factors informed the modification of the instructional intervention for more effective achievement of the pedagogical goal.

(v) The second cycle implementation of ABLECAT thus involved the change of the instructional environment to respond to the earlier identified factors that inhibited the first cycle implementation of the intervention.

(vi) Post second cycle implementation of the intervention was evaluated to identify the unintended effects of the instructional environment which are likely to impact on the achievements of the identified pedagogical goal.

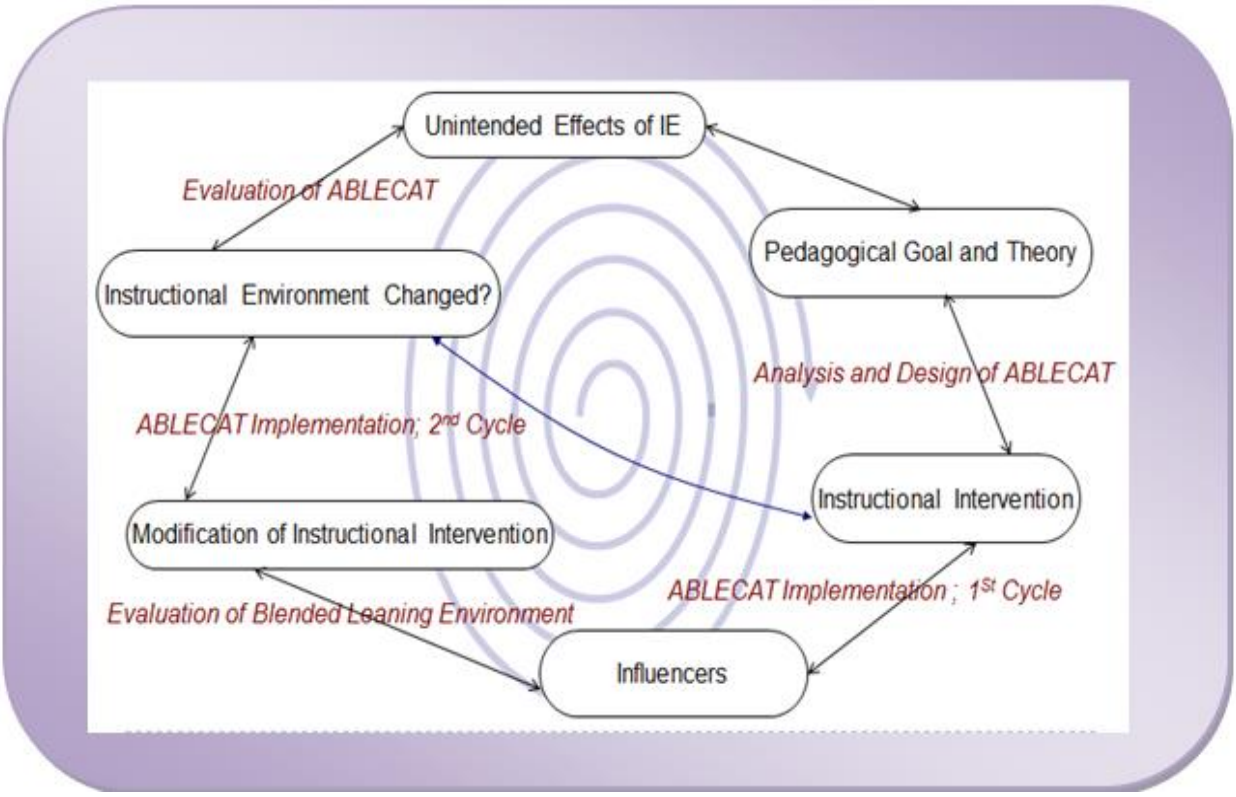

Figure 3-4: Formative Experiment Model for this Study

3.3.1 The choice of formative experiment explained

Having explained the relative importance and the perspectives of the three models and frameworks to the methodology of design-based research, formative experiment was used as the research strategy for this research study. The adoption for the above formative experiment model was influenced by a variety of factors.

First of all, formative experiments have been used to guide a number of literacy development research studies. Like all literacy programmes elsewhere, the CS course is an academic literacy course, meant partly to stem the downward trend in the quality of writing of undergraduate students in Ghanaian universities (Afful, 2007). This therefore, calls for a research strategy that could provide guidance about what factors might be relevant to a successful implementation of an intervention iteratively in a particular context (Bradley & Reinking, 2011c). Hawkins & Collins (1992) refer to the successive refinements in formative experiment as a strategy which does not test the isolated effectiveness of particular technologies but rather the success of such technologies are measured according to a set of criteria that are indicative of effective instructional practice for improved learning.

Secondly, the choice was made because instructional intervention is often at the centre of formative and design experiments (Reinking & Bradley, 2008). Reinking and Bradley (2008) define intervention as a single, well-defined instructional activity which is usually implemented during a specific period in the school day, or a change in the physical or organisational environment of the classroom, or a coherent collection of instructional activities with the aim to accomplish a specific instructional goal.

Additionally, instructional intervention in formative experiments provides for assessment practices, which this research study has provided for. Hawkins and Collins (1992) argue that, apart from setting up situations where teachers can observe students' thinking, the students' actual work process and products are used to judge their progress and to adjust learning situations in formative and design experiments. Furthermore, formative experiments fall into a category of research strategies that can produce useable knowledge (Bradley & Reinking, 2011). Firestone (1993) suggests that such strategy can facilitate the investigation of theoretical generalization and case-to-case generalization.

The pedagogical goal of this study, that is, designing a blended learning environment for the improvement of the knowledge and skills of the students in the CS course and the activities that comprise the intervention could produce useable design knowledge. Therefore, the choice of formative experiment is suitable for the study (Bradley & Reinking, 2011).

3.3.2 The Research approach of the study

Pragmatism was adopted as the approach to this study. According to Patton (2002) pragmatism emphasises on 'what works' and 'how to solve problems'. He argues that pragmatism means judging the quality of a study by its intended purposes, available resources, and procedures followed, and results obtained, all within a particular context and for a specific audience. Pragmatism often involves mixed methods research where a combination of the elements of qualitative and quantitative approaches such as the use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques are used for the purpose of breadth and depth of understanding and corroboration (Driscoll, Appiah-Yeboah, Salib, & Rupert, 2007; Hesse-Biber, 2010).

The focus of this research is geared towards designing 'what works' for the achievement of the identified pedagogical goal and 'practices' that would enable the achievement of such a pedagogical goal (Creswell & Plano Clark, 2011). Pragmatism also ties in with the objective of the

study, that is, to promote *democratic ideals* which include the involvement of practitioners and students in the research study (Bradley & Reinking, 2011c). The research study is therefore, a collaborative relationship among practitioners (that is, the lecturers of the CS course), the researcher and the students. The literature on formative experiment shows that it is also consistent with pragmatism, (Dillion, O'Brien, & Heilman, 2000; Wang & Hannafin, 2005; Reinking & Bradley, 2008). The research utilized an iterative design, development and implementation of ABLECAT, a blended learning environment for the improvement of knowledge and skills of the students in the CS course. Wang & Hannafin (2005) referred to this type of strategy as the *generation of conceptual and practical dissemination* in a pragmatic explication of design-based research. A learning design sequence formed the underlying principle or framework for the design and eventual implementation of ABLECAT.

3.4 Description of the site of the research

To maintain methodological rigor in formative experiments, Reinking & Bradley (2008) advised a careful selection and justification of a research site. Such a site must possess initial conditions that suggest that the success of the intervention will face some hurdles but with conditions not so overwhelmingly challenging as to doom the intervention to failure. This study was conducted at an undergraduate classroom in one of the four campuses of the University of Education, Winneba – Ghana. The Kumasi campus is located 320 kilometres from the main campus in Winneba and 280 kilometres north of Accra the capital city of Ghana. The Kumasi campus hosts three faculties, namely the Faculty of Business Education, the Faculty of Vocational and Technical Education, and the Faculty of Education and Communication Sciences. The student population of the campus as at the time of the research study was 6,282, made up of 4,311 male and 1,971 female students (see Table 3.1).

Table 3-1: Summary of Faculty Enrolment (Full time) 2011/12 academic year

Faculty	1st Year Students	2nd Year Students	3rd Year Students	4th Year Students	TOTAL Students
Social science (Winneba campus)	550	334	291	243	**1,418**
Educational studies (Winneba campus)	670	572	397	367	**2,006**
Agriculture Education (Mampong campus)	501	383	482	435	**1,802**
Languages Education (Ajumako campus)	698	588	549	492	**2,327**
Business Education (Kumasi Campus)	***609***	***668***	***763***	***802***	***2,842***
Creative Arts Education (Winneba campus)	415	387	373	359	**1,534**
Technical/Vocational Education (Kumasi	***565***	***1,073***	***1,012***	***696***	***3,346***

Campus)					
Science Education (Winneba campus)	587	532	588	551	**2,261**
Education and Communication Sciences (Kumasi Campus)	***57***	***37***	**-**	**-**	***94***
TOTAL	**4,652**	**4,574**	**4,455**	**3,945**	**17,630**

Source: University of Education, Winneba – Basic Statistics for 16th Congregation (November, 2011)

This site was chosen for the study because, first and foremost, although available research on CS at other universities suggests relative high failures of students in the course (Coker & Abude, 2012), available data from the Kumasi campus suggests the contrary (see table 3.2 below). Stakeholders in the educational system are however, suggesting that graduates from the universities are deficient in CS (Afful, 2007; Kodom-Gyasi, Nartey, & Coker, 2011; Coker & Abude, 2012). This study therefore, explored whether this situation is as a result of the pedagogical approach to the teaching and learning of CS or the learning environment. Secondly, the analysis of the instructional context as well as conditions prior to introducing the intervention suggests that there would be potential hurdles in the implementation of the intervention. However, such hurdles were not considered catastrophic enough to make the study impossible.

Table 3-2: General performance of students in the CS course - Kumasi Campus

Year/ Grade	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
A	19	1	68	79	35	68	88	217	229	34	107
B+	31	6	92	78	64	137	123	175	219	131	183
B	98	33	101	92	96	172	136	249	162	224	261
C+	102	109	102	109	108	87	137	153	95	168	206
C	155	139	87	88	74	46	142	78	49	151	137
D+	101	161	39	52	50	21	107	35	19	65	76
D	82	178	15	58	23	16	62	12	12	37	74
E	9	5	40	2	10	0	25	0	0	6	12
IC	0	0	0	38	1	0	10	6	3	9	10
Total	**597**	**632**	**544**	**596**	**461**	**547**	**830**	**925**	**788**	**825**	**1066**

Source: University of Education, Winneba Online Students Information System (2012)

Finally, the choice of the site for the study was also influenced by the long association of the principal researcher with the selected institution. This facilitated easy access to the University's ICT infrastructure as well as access to the lecturers and the students for the conduct of the formative experiment.

3.5 An overview of the Research Process

This research process comprises five phases. The first phase took the form of a meeting with the CS course lecturers and the head of the department that runs the course. The background and purpose of the study was explained at this meeting as well as the timelines involved in the proposed intervention. Permission was obtained for the experiment to be carried out in the required setting.

The second phase involved the gathering of baseline data. This phase started from the 22nd August 2011, the first semester of the 2011/2012 academic year, to the 7th of October, 2011, a period of 7 weeks. Qualitative data sources during this baseline phase included focused interview with the CS course lecturers, secondary data analysis and classroom observation. Quantitative data sources included the survey of the students to obtain their demographic characteristics and their basic ICT skills. Additionally, a baseline proficiency test was administered in the form of Written Communication Test (Argument writing) on the students. This was to establish a pre-intervention benchmark against which students' progress during post-intervention could be measured.

The third phase involved the design of a *learning design sequence* based on the design propositions for the intervention. The *learning design sequence* gave meaning to the blended learning environment (ABLECAT) as an intervention. The first cycle implementation of ABLECAT lasted for a period of five weeks between the week ending 21th October, 2011 and the 18th of November 2011. Qualitative data was collected at the phase using classroom observation of both the lecturer's teaching and the students' learning processes with ABLECAT. The students and the lecturers were also interviewed through informal conversational interviews. Additionally, there was data gathering on the students' use of the online learning environment through their activity logs.

The fourth phase of the research process took the form of a redesign of ABLECAT based on the data gathered after the first cycle implementation of the intervention at the third phase. The redesigned ABLECAT was re-enacted at the second cycle implementation of the intervention for use in the second semester of the 2011/2012 academic year. The re-enactment took place between the week ending 9th March 2012 and 20th of April 2012, a period of seven weeks. This semester

involved the second phase of the CS course. According to the course description, the students were expected to build on the knowledge and skills acquired in the first semester. Normal teaching and learning was programmed for eleven weeks. At the re-enactment phase, data was gathered in the form of the students' online activity logs and informal conversational interviews with the students and the lecturer on the use of ABLECAT.

The fifth and final phase involved collecting and analysing post-intervention data. This included a survey of the students (participants) to ascertain their perceptions in the use of ABLECAT. The administration of a post-intervention written communication test (argument writing) took place and evaluated against the baseline performance test conducted during the pre-intervention data collection stage.

3.6 **Data collection and analysis Methods**

Both qualitative and quantitative data were collected in a concurrent embedded mixed methods approach (Creswell & Plano Clark, 2011). Creswell & Plano Clark (2011) define mixed methods approach among others as the method that focuses on collecting, analysing, and mixing both quantitative and qualitative data in a single study or series of studies. Its central premise is that the use of a combination of quantitative and qualitative approach provides a better understanding of research problems than either approach alone.

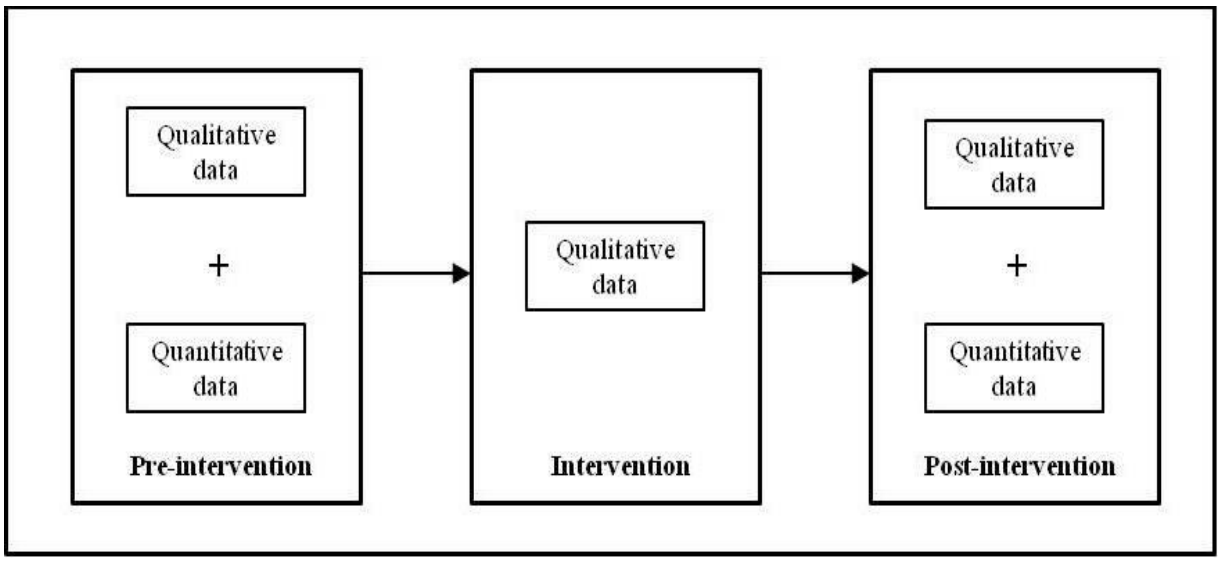

Figure 3-5: The embedded concurrent mixed method design of the study
(Adapted from Creswell & Plano Clark, 2011)

The choice of an embedded mixed method design (figure 3.5) stems from the fact that different questions which required different types of data were used to set out the methodological framework to address the primary purpose of the study (Creswell & Plano Clark, 2011). With such formative experiment research design, a single data set could not be sufficient for the chosen methodological framework especially where different questions needed to be answered in the various phases of the research study (Hesse-Biber, 2010).The concurrent mixed method design was therefore, used:

(i) to gain a more robust understanding of qualitative results by integrating quantitative findings. The findings from both sources of data would be in conversation with one another and therefore weave a richer and more complex story at the data analysis stage of the study (Driscoll, Appiah-Yeboah, Salib, & Rupert, 2007);

(ii) to triangulate the research findings – This is to enable a comparison of the extent to which results found using one method agree with the results found using another method (convergence); (Creswell & Plano Clark, 2011)and

(iii) to explore divergent or disparate findings to facilitate a more complex understanding of the research problem (Hesse-Biber, 2010).

This approach was deemed suitable because this study utilises formative experiment with outlined goals of data collection that could produce rich explanatory descriptions and link interdependent variables in an authentic educational context to pedagogical outcomes in ways that could inform theory (Reinking & Bradley, 2008). The goals of data collection for this study are encapsulated in Reinking & Bradley (2008) as follows:

(i) *Characterising the instructional context* – this means collecting data that characterise the instructional environment at the outset of the investigation and tracking changes as the intervention is introduced;

(ii) *Establishing baseline performance of conditions prior to introducing the intervention* – collecting data to establish a benchmark against which progress might be measured in relation to accomplishing a pedagogical goal or bringing about desired changes in perspective, practice, or behaviour;

(iii) *Identifying factors that enhance and inhibit movement toward a specified pedagogical goal* – collecting data to identify the factors that speak to an intervention's effectiveness and efficiency in reaching a pedagogical goal and, in many instances, its appeal to all stakeholders;

(iv) *Documenting the effects of instructional moves aimed at enhancing the effects of an intervention* – collecting data to determine what factors enhance or inhibit an intervention's effectiveness, which informs adaptations of the intervention or the way it is implemented, and then determining if those adaptations have achieved a desired effect;

(v) *Identifying and seeking explanations for unanticipated effects and outcomes* – collecting data to suggest modifications to existing theory or the development of new theory and suggesting further research that might be aimed at accomplishing other goals or testing other theories;

(vi) *Determining the extent to which an intervention has transformed a learning environment* – collecting data to determine the potential of changing more fundamentally the instructional environment of teaching and learning;

(vii) *Identifying conditions under which an intervention does or does not work well toward developing theory and improving practice* – collecting data to document the history of conjectures that were supported or refuted by the data gathered during the investigation aimed at drawing conclusions, clarifying theory, and offering recommendations;

(viii) *Comparing and contrasting the effects of an intervention (or alternative interventions) across diverse contexts* – collecting data to determine the scale of the intervention

A look at the summary of the goals of data collection in formative experiments above indicates that both qualitative and quantitative methods of data collection would best support this research study. Apart from using the qualitative data to generate thick descriptions of the instructional environment prior to the intervention, it was also used to better understand the factors that enhanced or inhibited the use of ABLECAT. The qualitative data was also used to understand how the theory underlining the design of ABLECAT fed into its use by the students through the modifications made during the implementation phases, as well as a means that enabled the researcher to measure the unanticipated effects of the intervention.

The quantitative data obtained from the survey of students determining their demographic characteristics and basic ICT skills were also helpful to establish a baseline for the intervention, and the pre and post intervention written communication tests were used to measure progress towards achieving the set pedagogical goal (Reinking & Bradley, 2008). Thus, in this study, qualitative data was collected throughout the study and quantitative data was collected prior and after the intervention. The table 3.3 below is the type of data collected at each stage of the formative experiment.

Table 3-3: Goals of data collection and the type of data collected in the study

Phase	Goal	Qualitative data used	Quantitative data used
Pre-intervention	Characterizing the instructional context	Focused interview Documentary secondary data Classroom observation	Survey: demographics of students students basic ICT skills Written Communication Test – Argument writing
	Establishing baseline performance or conditions prior to introducing the intervention		
Intervention First cycle	Identifying factors that enhance and/or inhibit the movement towards the pedagogical goal	classroom observation informal conversational interview online activity logs	
Intervention Second cycle	Identifying and seeking explanations for unanticipated effects and outcomes.	Informal conversational interview online activity logs	
Post-intervention	Determining the extent to which the intervention has transformed the learning environment.		Survey: students' questionnaire Written Communication Test – Argument writing

3.6.1 Qualitative data Collection Methods – Pre-intervention

3.6.1.1 Focused Interview

As part of the requirement of the formative experiment, a focused interview was conducted to help in the characterization of the instructional environment. According to Merton &Kendall (1946) the purpose of a focused interview is to determine the responses of persons with previous exposure to a situation that is being analysed by the researcher. The respondents of focused interviews are therefore chosen because of their known involvement in a particular situation and are asked by that involvement (Bryman, 2008).

In this study, the choice of a focused interview was made first, to appraise the design propositions from the lecturers' point of view with regards to the literature on teaching and learning of the CS course. This was done using semi-structured interview guide (See Appendix1 for full details of the interview guide). Reinking & Bradley (2008) referred to this process as the collection of data which describes the learning ecology at the beginning of a study. Cobb, Confrey, diSessa, Lehrer, & Schauble (2003) explained a learning ecology as traditionally comprising the tasks and the

problems that students are required to perform or solve, the kinds of interaction that are encouraged and the norms of participation established, the tools and related material means provided, and the practical means by which classroom teachers can conduct relations among these elements.

The focused interview was therefore, appropriate for seeking data that could characterise the instructional context because the lecturers of the CS course are involved in that particular concrete situation. Based on a literature review, a designed proposition related to the situation has been drawn. An interview guide that set forth the major areas of inquiry was designed with the interview itself focusing on the subjective experiences of the lecturers who are exposed to the pre-analysed situation (Merton & Kendall, 1946).

Secondly, a focused interview was chosen because the busy academic and professional schedules of the lecturers of the CS course did not permit the use of a planned focus group interview. Apart from the choice of the semi-structured interview facilitating the inclusion of some prompts to help the lecturers provide the needed answers, it also provided the opportunity to discuss the characterisation of the instructional environment in detail.

The focused interview was conducted during the week ending 26th August 2011. Due to their heavy professional schedules, two of the CS course lecturers, the acting dean of the faculty and the head of department could not be reached for the interviews. The coordinator for the English language programme also did not take part. However, the other two lecturers, who incidentally were to teach the course for the next two semesters of the formative experiment, took part in the interview. The interviews were conducted in their offices. Their consent was sought for the video recording of the interview. Each of the interviews lasted approximately fifty minutes and was used to solicit for views on provision or otherwise of the relevant teaching and learning environment and resources that promote or hinder the cognitive engagement, interaction, activities and assessment in the CS course (see Appendix A).

3.6.1.2 Documentary Secondary Data

As an insider-researcher, an approval was obtained from the Deputy Registrar of the University to use data from the university's annual reports and press releases for the research project as specified in the research policy document of the university (UEW, 2010). The relevant annual reports and press releases were the annual Vice-Chancellors' State of the University address to convocation and the annual Vice-Chancellor's report at congregation ceremonies (Asabere-Ameyaw, 2011). These two documents provide details of first, the annual ICT and library infrastructure

development report of the university and second, the mode of admission of fresh students, the categories of students for each faculty and the entire students' population of the university both of which contain information relevant to the research project.

3.6.1.3 Classroom observation

Another pre-intervention data gathering method used in characterizing the learning ecology at the pre-intervention stage was classroom observation. According to Angrosino (2005), social scientists observe both human and the physical settings in which their activities take place. To complement the accounts of the lecturers in the focused interview, the teaching and learning environment and resources that are used to promote the cognitive engagement, interaction, activities and assessment in the CS course were observed and accounted for. This is to prevent the sole dependence on the accounts of the lecturers (Cooper & Schindler, 2006; Cohen, Manion, & Morrison, 2007).

Secondly, the choice of this data collection method also facilitated the capturing of the complete teaching and learning event as it occurs in the setting of the CS context (Cooper & Schindler, 2006; Creswell, 2012). Again, since respondents in an interview, might not want to report fully and or fairly, an observation served to provide a reality check (Cohen, Manion, & Morrison, 2007). This is because in a study such as this, respondents may actually perform an act differently from how or what they say they do (Cohen, Manion, & Morrison, 2007; Robson, 2002).The observation approach at this phase of the research study therefore, was appropriate because with a carefully prepared recording schedule, problems that might occur due in part by time gap between the act of observation and the recording of the event, be it selective or faulty memory in the field notes were avoided (Cohen, Manion, & Morrison, 2007).

Direct observation which has been defined as the physical presence of the observer to personally monitor events being observed (Cooper & Schindler, 2006) was used. This method was useful since it allowed for reaction to and reporting of events and behaviours as they occur. It was therefore, possible to freely shift places, change the focus of the observation and concentrate on unexpected events as they occur. Permissions were obtained from the lecturers and the students and the observation sessions were video recorded. This was to overcome the anticipated challenge of the time gap between the act of observation and the recording of the event in the field notes. It also prevented the situation of, becoming overloaded as the events of the teaching and learning move quickly and later reconstructs them as well as avoiding fatigue, boredom and distracting events

which could reduce the accuracy and completeness of the observation in the classroom (Cooper & Schindler, 2006).

The observation took place on the 17th October 2011. The lecture was held in a large room that accommodated the seventy-five students, albeit in some uncomfortable situation (see figure 3.6 below).

Figure 3-6: A shot of the video-taped lecture during the observation session

The lecture schedule was from 5pm to 8pm. The lecturer's teaching equipment comprised of a chalkboard and markers. There was no public address system or an audio equipment to amplify the lecture's voice to reach out to the students at the extreme end of the lecture room.

3.6.2 Quantitative Data Collection Methods– Pre-intervention

3.6.2.1 Demographical survey of students

As part of characterizing the instructional context and establishing conditions prior to introducing the intervention, a researcher-developed demographic survey was used to collect data to help describe the profile of the participating students of the study to identify the contextual factors

that could be of help to the research. The survey was done to ascertain the students' demographic characteristics such as uniformity of group, ages, experiences, among others in relation to the general undergraduate student population in other universities in the country. The survey also assessed the students their preparedness in terms of their ICT skills for the utilization of the ICT infrastructure both in the library and on the campus to participate effectively in the envisaged blended learning environment (McKenney & Reeves, 2012) – (see Appendix B).

The data collected through the survey was analyzed using descriptive statistical procedures for calculating frequencies and percentages in SPSS v16.

3.6.2.2 Baseline performance test

The framework which underpins this research (Reinking & Watkins, 2000) requires the establishment of a baseline performance or conditions of the participants prior to introducing the intervention. This was needed to establish a benchmark against which the progress of the student could be measured in relation to accomplishing the pedagogical goal or bringing about desired changes in practice (Reinking & Bradley, 2008). Therefore, to test the students' CS proficiency level at the commencement of the academic year, the students took a Written Communication test (Argument Writing). The standard of the test borrowed ideas from the Graduate Skills Assessment (GSA) test (Hambur, Rowe, & Luc, 2002). This proficiency test was also comparable to what is usually administered by the university to assess students' competencies in CS during and at the end of the semester. The written communication test was administered in the fourth week of the semester (28/10/2011).

The test required students to develop their points of view about the issue and subsequently structure and present an argument in support of the view. The criteria for assessment included quality of thoughts and ideas (for example, depth of analysis of issues or information); structure and organisation (for example, effectiveness and purposefulness of organisation);and language and expression (for example, control of language conventions, clarity and effectiveness of expression) – (see Appendix C).

In line with the practices of scoring essay test (WAEC, 2011), the CS course lecturer assigned scores for the four aspects as follows: *content* = 30; *organisation* = 20; *expression* = 40; *Mechanical Accuracy* = 10. Each participant's script was photocopied, and the two CS lecturers marked the scripts. The marked scripts were then given to the head of the department who

moderated the final scores for each aspect of the pre-intervention test. The moderated scores for the pre-intervention for each student were keyed in SPSS (v16) for descriptive analysis.

3.6.3 Intervention Phase – first cycle and data collection

The formative experiment model used for this study required an approach to data collection at this phase that would determine factors influencing the achievements of pedagogical goals. Such data are also required in the determination of which practices in the instructional environment that are needed to be discontinued, adapted or transformed to achieve the pedagogical goal (Bradley & Reinking, 2011c).The direct classroom observation, informal conversational interviews with students and the lecturer, and online activity logs of students were therefore, used to determine the factors that enhance and or inhibit the success of the intervention towards the achievement of the set pedagogical goal.

3.6.3.1 Classroom observation

At this data gathering phase of the research, the use of field notes becomes appropriate with the classroom observation to document the effects of instructional moves aimed at enhancing the effects of the intervention. Field notes are described as the text (words) – data that are recorded during an observation (Cohen, Manion, & Morrison, 2007; Creswell, 2012).This study utilised the observation checklist as proposed by Spradley (1980) and adapted them to suit the context of the research (see table 3.4).

Table 3-4: Classroom Observation Checklist in CS Session

Object for Observation	Description
Space	The physical setting where the CS course took place
Actors	The students and the lecturers in the CS teaching and learning session
Activities	Sets of related acts taking place during the teaching and learning sessions of the CS course;
Objects	Artefacts and physical things available in the space facilitating the teaching and learning process
Acts	The specific actions of the actors in the course of the session
Events	the sets of activities that took place in the course of the observed session
Time	When specific sequence of acts, activities and events took place that impacted of the teaching and learning session
Goals	The efforts of the actors to achieve the learning objective of the session.
Feelings	The feeling of the actors as they expressed them

Through the use of the video recordings of the mini-lecture, data was collected that document the effects of instructional moves that could enhance or inhibit the achievement of the pedagogical goal. This classroom observation for the first cycle intervention took place from the 17th October 2011, to the 7th November, 2011.

3.6.3.2 Informal conversational interviews

Conversational interviews were used at this part of the data collection process to supplement the direct classroom observation. An interview is a two-person conversation initiated to obtain research-relevant information, and focused on content specified by research objectives of systematic description, prediction, or explanation by a researcher (Cannell & Kahn, 1968). Patton (2002) describes informal conversational interview as involving the spontaneous generation of questions in the natural flow of an interaction, often as part of on-going participant observation fieldwork. The persons being talked to may not even realise they are being interviewed.

An informal conversational interview thus offered a high level of flexibility in pursuance of information through all appropriate means, depending on what emerged in the observance of the teaching and learning situation or from talking with one or more actors in that situation (Patton, 2002). In view of this, data gathered from informal conversational interviews differ from each person interviewed or the same person may be interviewed on different occasions with questions specific to the interaction or event at hand where previous responses can be revisited and deepened.

The informal conversational interview approach used required greater amount of time to collect systematic information because it took several conversations with different people before a similar set of questions has been posed to each participant in the setting as corroborated by (Patton, 2002). Added to this is the fact that different questions from this approach generated different responses therefore, data gathered from this approach was cumbersome to pull together and analyse. Notwithstanding the above challenges, the informal conversation interview for this phase of the study facilitated the gathering of information that have direct bearing on the third stage of the formative experiment model used.

Secondly, the conversational interviews were conducted as a follow up on the observations in the teaching and learning situation in the mini-lecture phase of the enactment procedure. This method could facilitate the validation of the observations and to probe deeper into the motivations of the respondents and their reasons for responding as they did (Cohen, Manion, & Morrison, 2007).

At this phase of the research study, the informal conversational interview with the students centred on the *pre-f2f* and the *mini-lecture* sessions of the intervention (see figure 5.1). The interviews sought to find out how the students received the announcement of the posting of reading materials on ABLECAT; whether they read the notes; whether they performed the task assigned; whether they were able to communicate their misconceptions to the lecturer via the forum posts; and how the pre-f2f session prepared them for the mini-sessions. The mini-lecture phase sought to find out the opinion of the students on the use of small group activity.

In the case of the lecturer, the interview centred on the activities at the mini-lecture session as to the students ability to communicate their misconceptions through the forums that were created for each week's topic. It also sought to find out whether she was able to respond to them; her opinion about the mini-lecture vis-a-vis the previous face-to-face lecture; and the use of the video recorded session.

The informal conversational interviews were conducted during the fourth week of the intervention. The students were randomly chosen as they attended their scheduled time of lecture and interviewed. In order to facilitate open and frank discussions, the interviews were not recorded but the summary of the answers given were noted to facilitate the analysis of the data. With regard to the lecturer, the video-taped recording of the mini-lecture session was replayed to drive the informal conversational interview without the use of a recording device.

3.6.3.3 Students' online activity logs

To be able to document the effects of instructional moves aimed at enhancing the effects of the intervention, the students' usage patterns of ABLECAT were recorded. These records, extracted from the various activities the students performed on the online platform served to complement the data collected through the informal conversational interviews and the observations.

The platform on which ABLECAT was designed had a mechanism to record the activities of each registered student from the pre-f2f stage as and when a student logs on to the platform to view the lecture notes and performs the assigned activities. The platform additionally records the student's post to the forum and the watching of the session videos. It also records the activity of the student when the small group activity is posted online and the grades of the student for completing the assignments. These records could be examined to determine the activities of each student for assessment of their level of utilization of ABLECAT. The examination of the students' activity logs was undertaken from the second week of the intervention.

3.6.4 Second cycle data collection

Given the complexity of educational contexts and instructional practice, the implementation of an instructional intervention could invariably produce unanticipated effects and outcomes, some of which may be neither directly related to the pedagogical goals of the intervention nor anticipated by whatever guiding theory of instructional intervention (Reinking & Bradley, 2008). Effective use of formative experiment therefore, requires data collection, analysis, and interpretation that facilitate the identification of such effects and outcomes.

In view of the above, informal conversational interviews and the students' online activity logs were used to gather information that could help identify and seek explanations for unanticipated effects and outcomes at the second cycle of the implementation of the intervention from both the students and the lecturer for the course.

The students' interviews were conducted at the Students' Representative Council's (SRC) constructed pavilions when small group activities were taking place. The interviews were meant to assess whether the changes made during the second phase were meeting their expectations especially with regards to the new format with the recorded video lectures. It also sought the opinion of the students on whether any adaptation or any additional modification should be made to the intervention.

The lecturer's interview centred on the impressions of the changes introduced in respect of the incorporation of the assignment and activities as part of the students' end of course grades, and how that has translated into the students' learning.

The use of the students' activity logs was meant to examine and determine the frequency of the students' use of ABLECAT in terms of pre-f2f session, the use of the video recorded lectures, performance of assigned activities, and postings on the forums.

3.6.5 Post-intervention data collection

Researchers using formative experiments are enjoined to collect data that identify conditions under which an intervention does or does not work well toward developing theory and improving practice (Reinking & Bradley, 2008). The post intervention data was therefore, used to either support or refute the data gathered during the investigation with the aim of drawing conclusions, clarifying theory, and offering recommendations.

This phase of data collection and the data gathered, therefore provided the pivotal research-practice interface around which the formative experiments revolved. Researcher-designed survey was used as the data collection instrument to gauge the students' perceptions of the use of the intervention. An exit performance test was conducted to provide the data to be used in comparison with the baseline performance test conducted at the pre-intervention data collection stage in order to establish a benchmark against which progress or otherwise could be measured in relation to accomplishing the set pedagogical goal. This was to test whether the blended learning environment has brought about the desired changes in the teaching and learning of CS.

3.6.5.1 Survey of students on their perception of the use ABLECAT

The researcher-designed questionnaire was used to gauge the perception of the students on the use of ABLECAT. With a sample population of more than seventy-five, not all of them could be interviewed to express their perception of the use of the intervention hence the questionnaire served as a tool to validate (triangulate) the informal conversational interviews conducted (Creswell, 2012).

Secondly, the questions were relatively brief and did not involve any controversial topic or issue, be it legal or social. The respondents were therefore, able to complete them without any impediments. Additionally, the university community provided an open social climate that allowed the students to provide full and honest answers without fear or intimidation. The research

questionnaire was therefore, a useful tool that was designed to collect data which was subsequently analysed later in the study (Denscombe, 2007).

The researcher-designed questionnaire was meant to find out the students' perceptions of the quality of the content, learning, communication and the level of engagement experienced with ABLECAT (see Appendix D). These areas were chosen for the validation of the design propositions that underlie the intervention. Apart from three items on the questionnaires which were dichotomous questions, almost all the other items were of the close-ended rating scales type eliciting responses from strongly agree to strongly disagree. The dichotomous questions were meant to elicit clear unequivocal responses on the issues that were raised (Cohen, Manion, & Morrison, 2007). However, in order to allow the students to write a free account of their overall thoughts about ABLECAT, one open-ended item was included for that purpose. The questionnaires were administered on the week ending 27th April, 2012 at the lecture room.

3.6.5.2 Exit performance test

Among the standards for determining methodological rigor in formative experiments, Reinking and Bradley (2008) suggest triangulation. Creswell defined triangulation as the process of corroborating evidence from different individual types of data and or methods of data collection (Creswell, 2010). Triangulation therefore, facilitates a more rigorous data collection and analysis that produce convergent evidence from multiple sources using multiple methods to produce findings, interpretations, and recommendations that are more trustworthy and convincing (Creswell, 2010;Creswell & Plano Clark, 2011) Having administered a researcher-designed questionnaire to gauge the perception of the students in the use of ABLECAT, the exit performance test served to corroborate the findings of the survey. Additionally, the exit performance test was used to determine the extent to which the intervention has transformed the learning environment, in this case the knowledge and skills of the students in the CS course.

The exit written communication test was administered in the last week of the semester (20/04/2012). Sixty-nine participants out of the 75 who registered for the CS course took part in this post-intervention assessment test. The students took a Written Communication test which was similar to the one administered at the pre-intervention stage with the same requirement and assessment procedures (see Appendix E). The marked scripts were then given to the head of the department who moderated the final scores for each aspect of the post-intervention test. The

moderated scores for both the pre-intervention and the post-intervention for each participant were keyed in SPSS (v16) for analysis.

3.7 Summary

This research study uses formative experiment research strategy to explore the design and implementation of a blended learning environment for the improvement of the knowledge and skills of undergraduate students in a CS course over a period of two semesters. The study employed both qualitative and quantitative data collection in a concurrent embedded mixed methods approach in four phases namely, pre-intervention, intervention – phase one, intervention – phase two, and post-intervention to implement the intervention towards achieving the set pedagogical goal. Both qualitative and quantitative data were collected to characterise the instructional context and to establish a baseline performance or conditions prior to introducing the intervention at the pre-intervention phase.

Qualitative data were collected to identify factors that enhance and inhibit movement towards achieving the pedagogical goal at the first phase of the intervention. At the second phase of the intervention, qualitative data was collected to document the effects of instructional moves aimed at enhancing the effects of the intervention.

Finally, both qualitative and quantitative data were collected to determine the extent to which the intervention has transformed the learning environment. The analyses of the various data collected together with the design propositions enumerated in the literature, a proposed learning design sequence upon which the blended learning environment was developed are all provided in the next chapter.

Chapter 4

4 Pre-intervention Data Presentation and Analysis and the Design of ABLECAT

For the successful implementation of the blended Learning environment intervention for this study, both quantitative and qualitative data were collected and analysed to determine the current state of the students' abilities in ICT and communication skills. This pre-intervention data was also used to identify the benchmarks with which the post-intervention data would be compared to determine the impact of the blended learning environment intervention.

4.1 Pre- Intervention qualitative data Analysis

In order to prepare the study subjects of the formative experiment and to determine their suitability for the study, various qualitative data collection approaches were used in gathering the pre-intervention data. Focused Interview was used to determine the state of current teaching and learning environment. Document analysis was also used in assessing the ICT infrastructure and other supporting policies governing teaching and learning in the university. Classroom observation was also used to identify the suitability of the settings and other learning artefacts that could be used in the intervention and also to observe the lecturers and the students in their usual teaching and learning environment.

4.1.1 Focused Interview

The CS course used in this study is a two-semester course. The first semester is handled by a Lecturer with a Master of Philosophy degree in Guidance and Counselling and nine years teaching experience in the CS course. In the second semester, the CS course is taught by a different Lecturer with a Master of Philosophy degree in Applied Linguistics and three years' experience in teaching the CS course. Both lecturers have relatively basic ICT skills and both were the target of the focused interview and the interviews were conducted separately.

Table 4-1: A Summary of the responses from the focused interview

Parameters	**Lecturer 1 (semester 1)**	**Lecturer 2 (Semester 2)**
Teaching Experience	9	3
Area of Qualification	Guidance and Counselling	Applied Linguistics
Mode of Teaching	Lecture	Lecture
Setting	Lecture Theatre (large)	Lecture Theatre (large)

Parameters	Lecturer 1 (semester 1)	Lecturer 2 (Semester 2)
Course Texts and Material	Lecturer prepared hand-outs/ notes	Lecturer prepared hand-outs/ notes
Teaching materials	Board and Markers	Board and Markers
Mode of Assessment	Mid semester Quiz and End of Semester Exams	Mid semester Quiz and End of Semester Exams
Interaction with Students	Occasional classroom discussions	Occasional classroom discussions
Use of ICT tools	None	None
Evidence of Impact of CS on Students	Students hardly use the language outside the lecture theatres	Not much impact is seen in their later academic endeavours since the current pedagogical trend favours rote learning.
Feedback from Students	Not Clear	Not clear
Suggestions for improvement	Reduction of class sizes; provision and utilisation of ICT tools by both students and lecturers.	A pedagogical approach that would ensure faster feedback to students as well as interactivity among the students and among the students and the lecturer.

The responses from the focus interviews confirmed that the teaching and learning practice of the CS course in Ghanaian universities is direct instruction and through a methodology that makes much use of repetitive practice and drill. The students gather in a lecture room for the duration of the lecture. Teaching and learning materials are mostly lecturer-prepared hand-outs/handbooks, the chalkboard and markers for illustrations, and at very large lecture theatres without the use of public address systems. Assessments and feedback from students are in the form of a general quiz conducted during the mid-semester, and one other assignment to make up for the students' continuous assessment marks towards a final grade for the end of the semester. These quizzes and assignment are based on the lecturers' hand-outs and handbooks.

The analysis of the responses from the focused interview with the lecturers of the CS course indicated the absence of student engagement in the teaching and learning environment. This is contrary to the constructivist assertion which argues that students' construction of their own knowledge is the essence of education. The educational institutions and teachers are therefore, the providers of an environment for the stimulation and encouragement of students' involvement in learning (Laurillard, 2012).

It was also clear from the interview that the teaching and learning of CS in both semesters do not utilize any ICT tools. The lecturers reported of large class sizes in large lecture theatres with no public address systems. This makes it very difficult for some of the students to even follow the

lectures. The absence of the recommended texts and the use of the electronic materials mean lecturers had to prepare hand-outs as notes for students. Students are also only assessed on one mid-semester quiz and end of semester examinations. Given the class sizes, it is difficult to give students feedback even from the mid-semester quizzes.

Asked what improvements they would like to see in the teaching and learning of CS, the lecturers recommended the reduction of class sizes, provision and utilization of ICT tools by both students and lecturers and a pedagogical approach that would ensure faster feedback to students as well as interactivity among the students and among students and the lecturers.

For their assessment of the impact of the CS course on the students, one of the lecturers in the focused interview when asked the question "How do your students employ the skills you teach them in the other courses you teach in their late academic years at the university? responded:

> "Apart from the lecture room, the language is not used among students and even with their lecturers; students therefore, find it difficult using the language in their academic work".

4.1.2 Analysis of Documentary secondary Data

The documentary analysis was used for obtaining data about the university's infrastructure that support teaching and learning and the number of students in the faculties and the year groups.

Table 4-2 Distribution of computers and Internet access on the University's campuses

Campus	**Networked computers**	**Internet bandwidth**	**Internet Service Provider**
Winneba	730	92 mbps	Vodafone Ghana
Ajumako	94	2 mbps	Vodafone Ghana
Kumasi	**190**	**10 mbps**	**Vodafone Ghana**
Mampong	105	6 mbps	Vodafone Ghana
20 study centres	140	40 mbps	Vodafone Ghana

Source: Vice Chancellor's address to Convocation – April 2011

The table 4-2 above is a presentation of the distribution of computers and Internet connectivity among all the campuses of the University of Winneba. The Kumasi campus where this study took place has 190 networked computers with 10mbps broadband internet connectivity. With a student population of 6,282, (see table 3.1) the student to computer ratio is 33:1

Table 4-3 Facilities at the Library of the Kumasi campus

Services	Quantity as at June 30, 2010	Quantity as at June 30, 2011	Available as at June 30, 2011	Accessibility	Hrs. per wk.	Remarks
Books	18,404	25,948	18,597	Univ. c'nty& public	78	
Serial titles	160	163	163	Univ. c'nty& public	78	
Journal titles	84	86	86	Univ. c'nty& public	78	
Online journals	22,147	23,000	22,147	Univ. c'nty& public	78	
Online databases	35	36	36	Univ. c'nty& public	78	
Photocopier	Nil	Nil	Nil	Nil	Nil	
Networked PCs	32	31	31	Univ. c'nty& public	78	
Catalogue cabinet	1	1	1	Univ. c'nty& public	78	
Virtual library mgt. system	15,251	100,000	22,306	Library staff	72	Titles

Source: Basic statistics of Vice-Chancellors annual report to the 16th congregation of UEW.

The data from the tables above show that in addition to the provision of Wi-Fi on the campus, there are 190 networked computers in the computer laboratories with Internet access. This affords the students the opportunity to access learning materials from the Internet. The library is stocked with books, journals and online databases (see table 4-3). Students can also access online materials from the library and with Wi-Fi.

Figure 4-1: The students could access Internet facilities both at the library and through Wi-Fi on campus

The secondary data shows that the Kumasi campus of the university where this study took place is positioned to embrace the teaching and learning with ICT tools given the relatively satisfactory ICT infrastructure.

4.1.3 Classroom Observation

To corroborate the responses from the focused interviews and identify how teaching and learning go in the CS class; classroom observation was undertaken during the first CS lecture of the semester (see table 4-4).

Table 4-4: Summary of classroom observation

Object for Observation	Description	Observations
Space	The physical setting where the CS course took place	A large Lecture room, Large class size, no public address systems. Not a big enough space for such number of students
Actors	The students and the lecturers in the CS teaching and learning session	75 freshly admitted students. 1 experienced lecturer.
Activities	Sets of related acts taking place during the teaching and learning sessions of the CS course;	The lecturer teaching and the students listening and taking down notes.
Objects	Artefacts and physical things available in the space facilitating the teaching and learning process	White board and markers where the teacher occasionally writes for emphasis
Acts	The specific actions of the actors in the course of the session	Very few questions were asked including request for repetition from the lecturer since the students at the back of the class could not hear the lecturer well. More students came in late.
Events	the sets of activities that took place in the course of the observed session	Students at the back not paying attention, notes taking
Time	When specific sequence of acts, activities and events took place that impacted of the teaching and learning session	Class started at 5pm and ended at 8 pm.

Object for Observation	Description	Observations
Goals	The efforts of the actors to achieve the learning objective of the session.	The lecturer was constantly asking the students if they understood what was being taught. Students were seen taking notes and asking colleagues what the lecturer said anytime they missed something.
Feelings	The feeling of the actors as they expressed them.	The lecturer was exasperated and complained about trying his best to shout loud enough for the students to hear. The students who came late and had to sit at the back of the class were disappointed because they could not hear most of the lectures that took place.

4.2 Analysis of pre-intervention quantitative data

4.2.1 Demographics and Entrance Qualifications

Seventy-five (75) students made up of sixty-three (63) male and twelve (12) female students whose ages range between eighteen (18) to fifty (50) years took part in the survey. The survey was meant to determine the demographic characteristics and their readiness to use ICT tools in learning so as to aid the design of the instructional environment. The students were all first year students at the Department of Information Technology Education of the University of Education, Winneba.

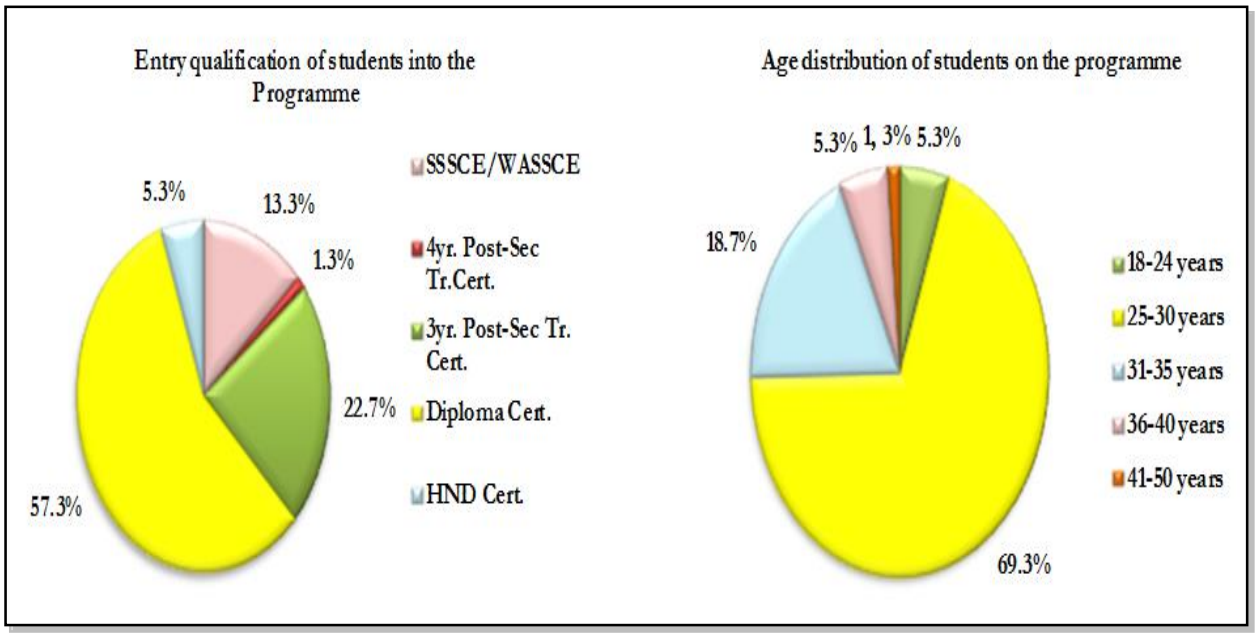

Figure 4-2: Entry qualification and Age distribution of participant

The figure 4-2 above shows that 13.3% were direct applicants with Senior Secondary School Certificate Examination results (SSSCE/WASSCE), 57.3% after completing the SSSCE/WASSCE have gone further to obtain some form of diploma certificate., 23% after completing the SSSCE/WASSCE have also gone further to obtain a teacher's diploma certificate, 5% have also gone through higher national diploma programme after the SSSCE/WASSCE programme and one student (1.3%) was identified to have gone through a 4 year teacher education programme after GCE 'Ordinary' certification programme. The above data on the profile of the participants shows that, all the participants were adults. However, most (87%) had left the second cycle institutions earlier and had gone further to acquire other qualifications.

The demographics of the students are not peculiar to the Kumasi campus. Admissions to the various courses in Ghanaian universities have no age restrictions. Anybody who satisfies the entry requirements of a chosen programme could be admitted provided the admission quota to the programme is not exceeded. This arrangement could result in class of students with some even nearing the retiring age of public service in Ghana. This presupposes that some students could be as old as the *mothers* and/or *fathers* of other students in the same class; as in this case, there are students in their teens and others in their forties. The challenge here is to mix this diverse group of students to go through continuous lecture duration of three hours when research shows that these young students might have a short attention span due to their age (Prensky, 2003).

Another issue that the students' demographics portray is the different entry qualifications of the students. Ghana has gone through three major educational reforms since 1973. These educational reforms have profound impact on the duration of programmes as well as required number of courses and subjects the students are required to graduate from the second-cycle level. The educational reforms of 1982 reduced the duration of pre-university education from 17 years to 12 years. The demographics of the students indicate that majority of the students went through the shortened period of pre-university education. The import here is that since the time these students spent in schooling using the English language is shorter than their counterparts who had 17 years of pre-university education, their level of the English language could be lower.

Indeed, the institution of the CS course in the Ghanaian universities in the mid-eighties has been attributed to the cohorts of students with shortened duration of pre-university education who started coming into the universities (Afful, 2007). Therefore, some of these students might require more help than others in the CS course, a course which aims partly as remediation of the students' language skills. Hence, the once-size-fit-all lecture approach together with course handbooks needs

revision. Therefore, it is argued for the design of a blended learning environment for the improvement of knowledge and skills of the students in the CS course.

4.2.2 ICT Skills Data

The relevant characteristics of the ICT skills survey instrument had a statistical significance of 0.95 (where reliability co-efficient of 0.70 or higher is considered acceptable in most social science research situations for reliability of a psychometric test).

Table 4-5: Characteristics of ICT skills of students

Characteristics - How well can you do the following?		I can do this very well by myself					I can do this with the help from someone					I know what this means but I can't do it					I don't know what this means				
	Age group	18-24	25-30	31-35	36-40	46-40	18-24	25-30	31-35	36-40	46-50	18-24	25-30	31-35	36-40	46-50	18-24	25-30	31-35	36-40	46-50
Start a computer	No.	2	46	9	2	0	1	5	3	2	1	1	1	0	0	0	0	0	2	0	0
	%	2.7	61.3	12	2.7	0	1.3	6.7	4.0	2.7	1.3	1.3	1.3	0	0	0	0	0	2.7	0	0
Open a file on a computer	No.	2	50	13	2	1	2	1	0	2	0	0	1	0	0	0	0	0	1	0	0
	%	2.7	66.7	17.3	2.7	1.3	2.7	1.3	0	2.7	0	0	1.3	0	0	0	0	0	1.3	0	0
Create or edit a file on a computer	No.	2	48	10	3	1	2	3	3	1	0	0	0	0	0	0	0	1	1	0	0
	%	2.7	64	13.3	4	1.3	2.7	4	4	1.3	0	0	0	0	0	0	0	1.3	1.3	0	0
Scroll a document up and down on a screen	No.	2	48	12	4	1	2	2	2	0	0	0	0	0	0	0	0	2	0	0	0
	%	2.7	64	16	5.3	1.3	2.7	2.7	2.7	0	0	0	0	0	0	0	0	2.7	0	0	0
Copy a file from a computer drive	No.	3	48	9	3	1	1	3	2	1	0	0	0	2	0	0	0	1	1	0	0
	%	4	64	12	4	1.3	1.3	4	2.7	1.3	0	0	0	2.7	0	0	0	1.3	1.3	0	0
Save a document or file on a computer	No.	3	52	12	4	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
	%	4	69.3	16	5.3	1.3	1.3	0	1.3	0	0	0	0	0	0	0	0	0	1.3	0	0
Print a document or file from a computer	No.	3	44	7	2	0	1	6	6	2	1	0	2	0	0	0	0	0	1	0	0
	%	4	58.7	9.3	2.7	0	1.3	8	8	2.7	1.3	0	2.7	0	0	0	0	0	1.3	0	0
Move files from one place to another on a computer	No.	3	48	12	3	1	1	3	1	1	0	0	1	0	0	0	0	0	1	0	0
	%	4	64	16	4	1.3	1.3	4	1.3	1.3	0	0	1.3	0	0	0	0	0	1.3	0	0
Get on to the Internet	No.	3	48	13	2	1	1	3	0	2	0	0	0	0	0	0	0	1	1	0	0
	%	4	64	17.3	2.7	1.3	1.3	4	0	2.7	0	0	0	0	0	0	0	1.3	1.3	0	0
Copy or download files from the Internet	No.	3	43	8	2	0	1	7	5	2	1	0	1	0	0	0	0	1	1	0	0
	%	4	57.3	10.7	2.7	0	1.3	9.3	6.7	2.7	1.3	0	1.3	0	0	0	0	1.3	1.3	0	0
Download music, pictures or movie from the Internet	No.	2	42	6	2	0	2	7	5	2	0	0	2	2	0	1	0	1	1	0	0
	%	2.7	56	8	2.7	0	2.7	9.3	6.7	2.7	0	0	2.7	2.7	0	1.3	0	1.3	1.3	0	0
Write and send e-mails	No.	2	46	12	2	0	2	5	1	2	1	0	1	0	0	0	0	0	1	0	0
	%	2.7	61.3	16	2.7	0	2.7	6.7	1.3	2.7	1.3	0	1.3	0	0	0	0	0	1.3	0	0
Attach a file to an e-mail message	No.	3	35	7	2	0	1	14	4	1	1	0	2	2	1	0	0	1	1	0	0
	%	4	46.7	9.3	2.7	0	1.3	18.7	5.3	1.3	1.3	0	2.7	2.7	1.3	0	0	1.3	1.3	0	0

From the data, 88% of the participants can perform the basic computer skills very well all by themselves; 8% can perform the basic computer skills with the help from someone; whilst 4% of the participants cannot perform the basic computer skills. When it comes to the basic Internet skills, 76% of the participants can perform the basic Internet skills; 19% can perform the basic Internet skills with the help from someone; whilst 5% cannot perform those skills at all. Specifically and

quite significantly, within the age groups of the participants, one person within the 41-50 year olds has no Internet skills, two participants aged between 25 and 35 years do not have Internet skills and four participants aged between 18 to 35 years do not have basic computer skills.

The ICT skills survey shows that majority of the students fall into an age category which has been labelled as Net Generation, Digital Natives or Millennials (Tapscott, 2008; Prensky, 2001; Oblinger & Oblinger, 2005). These terms are used for young people who are supposed to have grown up with computers and the Internet and are said to have a natural aptitude and high skill levels when using new technologies (Ryberg & Dirckinck-Holmfeld, 2010; Jones, Ramanau, Cross, & Healing, 2010).

In terms of how these young people learn, Barnes, Marateo, & Ferris (2007) posit that they tend towards independence and autonomy in their learning styles, which impacts a broad range of educational choices and behaviours, from 'what kind of education they buy' to 'what, where and how they learn'. They therefore, make conscious choices about what learning techniques work best for them, which can include reading lecture notes online, viewing interactive media such as PowerPoint presentations or digital images, or working in groups (Barnes, Marateo, & Ferris, 2007).

However, these lofty descriptions do not cover the entirety of the students who took part in the survey. There is a sizeable proportion of older people who could be characterised as being at least one step behind and unable to reach the kinds of natural fluency that comes with having grown up with new digital technologies. Additionally, there are also research findings that argue that these young people who are termed as Net Geners lack an understanding of ways in which such technologies can be used critically and creatively to support their learning.

This research study therefore, argues that a blended learning environment where the best of face-to-face learning environment and that of e-learning are pedagogical designed would meet the learning needs of these diverse group of learners to improve on their skills and knowledge in the CS course. This is because possession of ICT skills could become relevant in the teaching and learning situation only when they are harnessed to the students' analytical, creative and critical capacities, and the application of these to a particular problem of real concern (Ryberg & Dirckinck-Holmfeld, 2010).

4.2.3 Baseline Performance Data Analysis

To assess the current level of the students' capabilities in CS and use it as a baseline against which the post-intervention performance would be measured, a written communication test was

administered to all the students taking the CS course in the first semester. The students were graded in four areas namely, Content (30%), Organization (20%), expression (40%) and mechanical accuracy (10%). The baseline performance data shows that the means scores for each on the four performance indicators were content was 13.7 organisation was 10.70, *expression* was 13.7 and *mechanical accuracy* was 0.02

Table 4-6: Pre-Intervention baseline scores of participants

Criteria	Mean	Std. Deviation	Std. Error Mean
Content (30)	13.7	4.43	0.53
Organisation (20)	10.70	2.07	0.25
Expression (40)	13.7	4.43	0.53
Mechanical Accuracy (10)	0.02	0.18	0.02

This data also shows that, as a group, they performed very poorly in *mechanical accuracy*. The group performance in the other three categories was just average.

The performance of the students seems to validate other studies carried out in other Universities in Ghana. A study by Kodom-Gyasi, Nartey, & Coker, (2011) at the University of Cape Coast, Ghana suggested that the students who offered the CS course have an abysmal knowledge of parts of speech of the English language. This performance also affirms the literature on the institution of the CS that pre-university level writing is markedly different from that of the tertiary level hence fresh students to the universities are likely to carry the baggage of experience and skills which are unsuitable for university level academic work (Afful, 2007).

4.3 Design propositions of the Intervention

The potential at the University campus to use ICT tools in the development of knowledge and skills in the CS course, notwithstanding, studies have shown that engaging in course design or redesign is critical for any successful restructuring of the learning environment (Sharpe & Oliver, 2007; Mor & Winters, 2007). Therefore, this study advocates for the blend of the best practices in the face-to-face environment and the provision of ICT tools on the campus to facilitate the improvement of knowledge and skills of the students in the CS course.

The design proposition of the intervention is predicated on the reviewed literature on blended learning environments, the teaching and learning of CS as well as the analyses of the pre-intervention data.

Design Proposition 1: Providing teaching and learning resources specific to CS development in multiple formats such as audio, video and text through a blended learning environment would sustain the students' interest in the course and thereby promote their cognitive engagement in CS.

This provision, this study argues would offer the students with varieties of choice in the areas of the topics they are to study, how to explore the topics and consequently how to represent their understanding of the topics (Blumenfeld, Kempler, & Krajcik, 2006).

This proposition would also lead to a design of the blended learning environment that could cater for the needs of the students who are from different ethnic and social backgrounds, age group, technological knowhow and economic empowerment. Provision of the course content in multiple formats would help every student to assess a uniform aspect of a topic presentation in class through the online learning management system.

Secondly, since the data on the demographics of the students indicate majority of the students were in the age group of between twenty and thirty years, it was envisaged that multimedia presentation of the topics would appeal to the majority of the students and consequently, promote their cognitive engagement with the course (Blumenfeld et al, 2006), thereby improving their CS development. Additionally, since the university has provided ICT infrastructure in the university campus and at the library, students' access to the resources online might not be a challenge. Furthermore, since the data on the profile of the students indicates that majority of the students possess basic ICT skills their ability to access the online materials was unquestionable.

Proposition 2: Providing ICT tools such as forums and e-mail in the blended learning environment would enhance students' interaction and collaboration with both peers and lecturers to enhance their motivation and ultimately enhance their cognitive development in the course.

With this provision, not only will the students benefit from interpersonal interaction, but also from student-computer interaction that could result in enhanced input of information as well as help from the computer's installed help features and dictionaries(Chapelle, 2003). The proposition here, therefore, was to prevent the situation where the students would feel alone with resources and materials that are made available in the first proposition as well as the situation whereby the students would be at the mercy of the technical challenges the online learning environment could bring about (Calabrese & Faiella, 2011). This second design proposition was also central to the development of CS in the blended learning environment because in the literature of computer-assisted language learning, the use of online learning environment has been documented to facilitate the engagement

of learners in meaningful, large-scale collaborative activities resulting in improved language skills (Gruba, 2004a; Debski, 2000 & Warschauer & Kern, 2000). By providing the communications tools to meet the collaborative needs of the students the proposition was to facilitate the students' motivation in the teaching and learning of CS.

It is argued that collaboration enhances the students' motivation because it meets their needs for understanding as they work with their colleagues and lecturers (Blumenfeld et al, 2006). Again in collaboration, since some members of the group may be more proficient in the language skills or have more prior knowledge or different talents than others, the shared effort can diminish feelings of inadequacy (Blumenfel et al, 2006).

Furthermore, by providing an avenue for collaborative activities, the students would be offered a platform that would encourage them to offer clarification and explanation, as well as debate and critique each other's' ideas in the language and thereby improve on their CS development.

Design Proposition 3: Provision of task and activities with immediate feedback to the students in the blended learning environment would be able to build the students' understanding and use of the concepts in the CS course.

This design proposition was meant to offer the students a constant monitoring of their learning and an avenue that could lead to the improvement, correction and adaptation to the knowledge and skills in the CS course. Learning activities are explained as specific interaction among learners through the utilization of specific tools and resources towards the achievement of specific goals (Beetham, 2007).This definition supports the earlier design propositions whereby the provision of learning resources in multiple formats and the additional communication tools have been advocated to offer the students with greater choice in the areas of the topics they are to study, a greater choice in how to explore the topics and engender interactions among the students and between the students and the lecturer respectively. The design proposition of providing learning activities with immediate feedback was meant to encourage the students to understand their strengths and weaknesses and to offer opportunities for reinforcement in the course. The design of the blended learning environment was therefore, grounded on these three aforementioned design propositions.

4.4 Design phase of the Intervention

Based on the three design propositions outlined above, the assistance of the university's web designer, and an instructional designer was sought for the development of the blended learning environment. Being senior members of the UEW community, the two experts decided to offer their technical expertise on the design of the blended learning environment of the project free of charge. One of the major justifications for the conduct of a formative and design experiment is its ability to facilitate the development of a professionally productive relationship with lecturers and relying on their knowledge and expertise to help in the identification of influential factors of an instructional intervention's effectiveness, as well as to assisting in adapting the intervention and the classroom environment if required (Bradley &, Reinking, 2011).

The design of the blended learning environment took on a shared and collaborative effort. The web technologist had undertaken a training workshop organized by the Partnership for Higher Education in Africa Educational Technology Initiative (PHEA-ETI) which was meant to develop courseware for both hybrid and pure online delivery of instruction in higher educational institutions in Africa. The participation of UEW in the PHEA-ETI initiative at the South African Institute for Distance Learning was to fulfil the university's aim of configuring and installing MOODLE as an institution-wide Learning and Course Management System for distance education. Therefore, apart from using the research project as a platform to exhibit his technical and technological competence in the development of online learning environment, the design and development of the online learning environment of this study served as a test-bed for the web technologist in the wider implementation of the university's learning management system. His enthusiasm in the design and development of the blended learning environment cannot be over-emphasized. The instructional designer with a PhD in Psychology and Educational Sciences has taught post-graduate students in Educational Technology and Instructional Design. Credited with the conduct of numerous studies and publications in the field of Instructional Technology and Design, his role was to help define the end goal of instruction of the CS course and help create the task and activities in the blended learning environment.

To be able to define the end goal of instruction of the CS course the curriculum was first examined. Below is an extracted course outline of the CS course and the instructional strategies that are used for teaching and learning in the f2f environment (see Table 4.7).

Table 4-7: Weekly course content and instructional strategies (f2f lectures for the CS course)

(Extracted from one semester course outline – see Appendix F.)

WEEK	TOPIC	INSTRUCTIONAL STRATEGIES
1.	The writing process – pre-writing, writing, post writing stages	Lectures and class discussions
2.	Paragraph features – unity, coherence, linking expressions, introduction, conclusion	Lectures and class discussions
3.	Paragraph types – loose/direct, mixed/ pivot, periodic/suspended, emphatic, implied	Lectures and class discussions
4.	Analyzing essay questions or topics	Lectures and class discussions
5.	Narrative writing and argumentative essays – formal features	Lectures and class discussions
6.	Expository and descriptive essays – formal features	Lectures and class discussions
7.	Documentation – APA house style	Lectures and class discussions
8.	Comprehension – reading skills, analyzing questions, strategies of answering questions	Lectures and class discussions
9.	Summary writing – reading skills, analyzing questions, strategies of answering summary questions	Lectures and class discussions
10.	Revision	

The key components of the design propositions were to provide resources, task and activities, and an avenue for interaction and collaboration in a blended learning environment. This design approach was inspired by the ideas of Corbel, Gruba, & Enright's (2002) components of task design as adapted by (Gruba, 2004b) to design what is referred to in this research study as "ABLECAT task design" in order to provide a platform for a learning design sequence (see Table4.8).

Table 4-8: An example of a weekly task and activity on ABLECAT derived from the CS course outline (ABLECAT Task design)

Week	Topic	Task components	Text on ABLECAT
1	**The writing process: Pre-writing, writing and post-writing stages**	Introduction :	Writing, one of the four skills of language may or may not be one of the favourable activities we normally do at school. You may even fear writing if you were not taught well the processes that are involved because it is not just writing down anything that comes to mind readily. In fact, you need to carefully plan your writing so as to make it beautiful and attractive to the reader. As an aspect of communication, writing involves certain processes. A good piece of writing involves pre-writing, writing and post writing stages or phases. Each of the stages or phases has a number of processes that must be considered if you need to be a master writer.
		Statement of objectives:	By doing this task, you will be able to improve on your ability to produce an example of a feature writing. You will also gain experience in pre-writing, writing and post writing stages of the writing process
		Steps and processes:	Your are required to produce a narrative of why you chose to enrol on this programme. Pre-Writing stage: •Know your purpose •Know your audience •Develop a statement of purpose Writing stage: • List general points and details • Arrange general points and details •Write out an outline •Write a draft Post-writing stage: • Re-read and revise the draft •Check on the mechanics of writing • Re-write the final form and read over.
		Resources:	1. Brandon, B. (2001): Writing in the real world. GLENCOE Writer's Choice – Grammar and Composition.- Grade 11, Glencoe McGraw-Hill, New York. – Pick copies at the library 2. Lecture notes on ABLECAT
		Evaluation:	1. Post any misconception you may have on the topic from the readings to the forum that has been created for the topic on ABLECAT. 2. Attempt the quiz on the topic that has been set on ABLECAT 3. Bring your write-up for small group discussion at the mini lecture
		Conclusion and extension	Access the video comments and explanation of the topic on ABLECAT for review of the topic

(Adapted from Gruba, 2004b:77-78)

4.4.1 Tasks Design

- *Introduction*– This is to prepare and motivate the learner's interest in the topic area. The main focus of the introduction is to prepare and hook the learner's interest. Therefore, the introduction should be interesting, motivational and appropriate. For example, if the task includes a role or scenario, it should be outlined in the introduction. If the activity is more straightforward research task, then the teacher should provide a short overview of what the task is about and what the students will do.

- *Statement of objective* – This is used to describe clearly and simply what you expect learners to achieve. The statement of objective makes sure that the learners know why they are doing a task and what they will learn.
- *Steps and processes* – These explain the steps that learners should go through to achieve the objective. To be able to accomplish the task, the teacher should explain the likely steps that the learners should go through.
- *Resources*– These provide a list of authentic resources that learners can use to achieve the objective. It is recommended that the teacher directs the students to pre-selected resources that are related to the activity.
- *Evaluation*– This tells learners how to check their work through the provision of model responses that relate to a specific goal within an established curriculum. In this section, the teacher provides a way to tell the students that they have finished the task and how to check their answers.
- *Reflection and extension* – This is to encourage learners to think about what has been learned and how to apply that learning to different context.

The weekly tasks and activities represented in table 4.8shows what the lecturer expects the students to do, which can be referred to as an instructional activity design. The instructional activity design was therefore, used to design a learning design sequence for the development of ABLECAT (see figure 4.3).

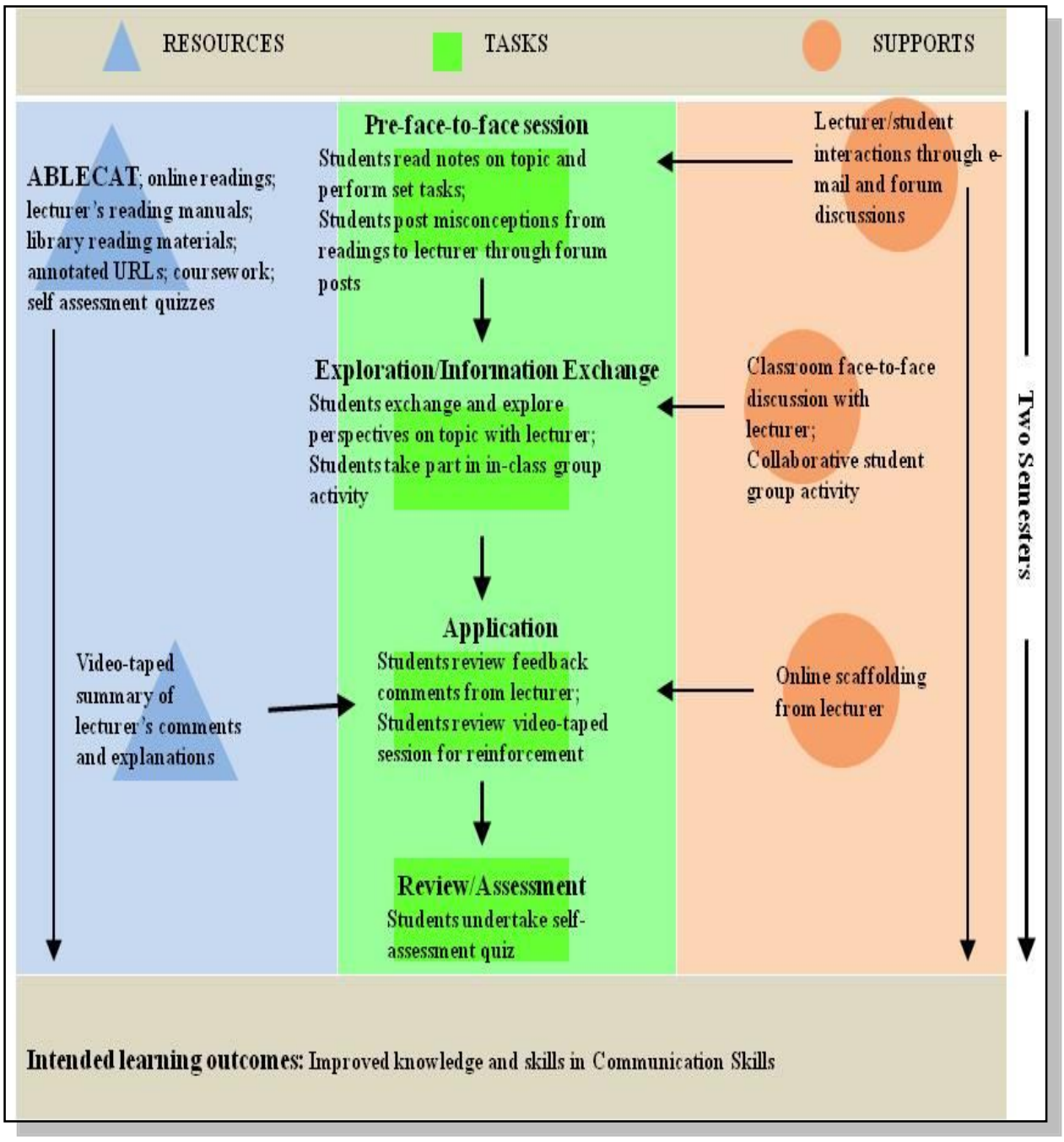

Figure 4-3: Learning design sequence for the development of ABLECAT

Adapted from Australian Universities Teaching Committee's project on ICT-based learning designs (http://www.learningdesigns.uow.edu.au/index.html)

4.4.2 The learning design sequence

- *Sequence*: △→□←○

The learning design sequence visually represents *Motivate*, *Explore*, *Apply* and *Review/Assess* design outlining the resources, tasks and supports needed for this design.

- *Tasks*: ■

  The learning in this design is based on four (4) tasks which flow in sequence and support the student in motivating, exploring, applying and reviewing/assessment processes and procedures of a conceptual nature.

- *Resources*: ●

  The resources that have been provided include online readings that relate to the various topics; lecturer's reading manuals; library reading materials related to the course; annotated URLs, course work, self-assessment quizzes, video-taped comments and explanations.

- *Supports*: ▲

  Supports are given in the form of lecturer/students and student/student interactions through e-mail and forums discussions. There are also classroom f2f discussions with lecturer and collaborative student small-group activities. Additionally, there is online scaffolding from lecturer for students.

4.4.3 The Components of the design sequence of the intervention (ABLECAT)

The learning design sequence is composed of four key components as visually represented in the figure 4-3 above. The components in this sequence are *Motivate*, *Explore*, *Apply* and *Review/Assess* which outlines the resources, tasks and supports needed for this design.

(i) *Motivate*: This is where pre-reading and writing activities are used as the means to stimulate the students into taking the centre stage in the learning process. This has been referred to by Garrison& Vaughan (2008) as "triggering events". This study refers to this component of the learning design sequence as "*motivate*". This is facilitated by the provision of tasks and activities meant to test the students' understanding of the pre-reading and writing activities.

(ii) *Explore*: This is the process where small group activity serves as a consolidation factor or what has been referred to as exploration (Garrison, Anderson, & Archer, 2001). This component of the learning design sequence is referred to in this study as "*explore*". Here, the mini-lecture and the small group activity are utilized by students to facilitate the exploration and exchange of ideas on the new information received during the session with their prior learning experience (Garrison & Vaughan, 2008)

(iii) *Apply:* This refers to the integration phase (Garrison & Vaughan, 2008). This component is referred to in this study as "*apply"*. This component provides for self-assessment quizzes to provide an opportunity for students for the application of their knowledge and skills.

(iv) Finally, the participants are offered the opportunity to express their thoughts on the topic. This strategy was meant to improve knowledge construction and also set the tone of initiation of dialogue on the next topic. Garrison & Vaughan (2008) refers to this phase as 'resolution' and it is represented in the learning design sequence of this study as "*review/assess*".

4.4 Summary

Following from the analysis of the pre-intervention data, three design propositions were adopted. The key components of the design propositions were to provide resources, tasks and activities and an avenue for interactions and collaboration in a blended learning environment. Using Corbel, Gruba & Enright's (2002) task design principles, a learning design sequence was developed which visually represents *Motivate, Explore, Apply* and *Review* and *Assess* outline that would be used for the enactment phase. Further explanations of this design are provided in the enactment phase of the intervention in the next chapter.

Chapter 5

5 ABLECAT – The enactment phase: The first cycle of intervention

5.1 Introduction

This enactment phase was where the new blended learning environment – ABLECAT was implemented in the CS classroom setting. Here, the goal was to utilise the designed learning environment in the CS classroom setting, identify the factors that enhance or inhibit its use at this phase and use the feedback to refine the new learning environment. This phase covered the first semester of the two semesters that were earmarked for the teaching and learning programme of the CS course.

5.2 Pre-enactment activities

The first pre-enactment activity was to register the students on the online learning environment. The information for this exercise was obtained from the University's Online Students' Information System (UEWOSIS). The information contained the names of the students, the application ID numbers given to students when they first made applications to be enrolled in the university which unique gender, date of birth, place of birth, year of admission, e-mail address and contact phone numbers. However, the information that was used for the online learning environment was the names of the students and their application ID numbers. The participants' application ID numbers were used to produce part of a generic e-mail address for the students. For example, a student with application ID number 116091 was assigned e-mail address 116091@uew-ksi.info, where the second part represents the domain course website address. The participants' application ID numbers formed their usernames and a generic password was created for them to be used to log on to the online learning environment.

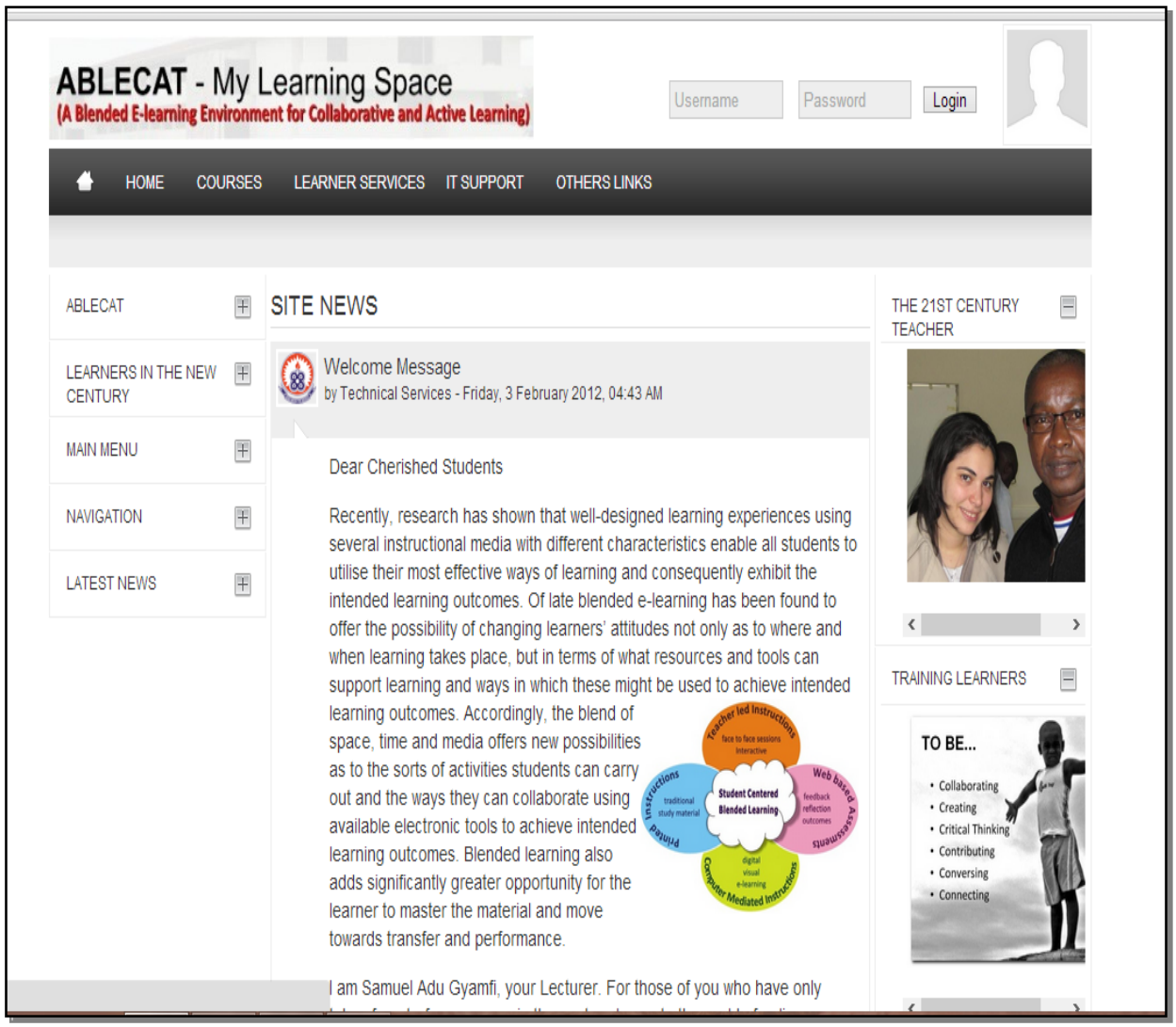

Figure 5-1: Homepage of the Learning Environment (ABLECAT)

The second pre-enactment activity was a two-hour orientation exercise that was organised for the participants of the research project on the 14/10/2011. The aims of the orientation exercise were:

(i) to explain to the students the rationale behind the formative experiment

(ii) to solicit the students' co-operation in the project and

(iii) to explain to the students how to work with the online learning environment.

The rationale behind the project is to use formative experiment to test the research proposition that blended learning environment offers students a better platform to facilitate effective knowledge and skills acquisition in CS. The orientation exercise was therefore, used as the means to ask for the consent and the co-operation of students for the research thus meeting the ethical requirements of the research policy of the university. The students were assured that the

experiment was solely for academic purposes and that their privacy and confidentiality would never be breached by their participation in the project.

The students were then taken through the use of the online learning environment. This involved how to log on to the website by using their application ID numbers as 'usernames' and the numbers 1 to 6 as their password. In order to prevent the use of unauthorised members of the public to have access to the website, the students were forced to change their passwords upon first access to the learning environment before proceeding to access information from their course. The students were taken through the process of the site navigation and the use of various tools such as forums and e-mails on the website. Links to these tutorials on how to use the tools were also provided at the website. Additionally, a print-out of these instructions was provided to the students.

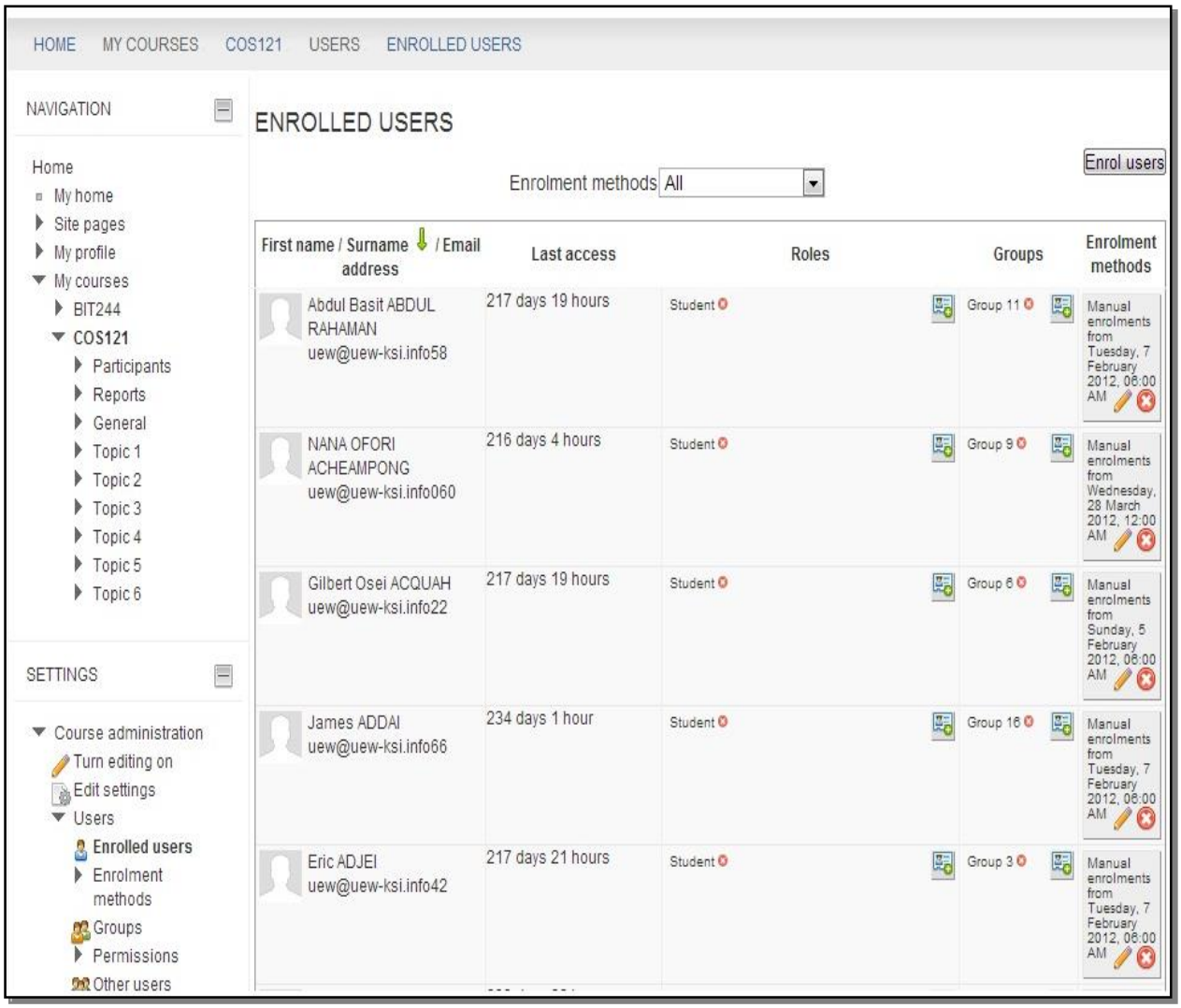

Figure 5-2: Students Enrolment Interface

5.3 ABLECAT enactment process Model

To help operationalize the learning design sequence, an enactment process model was developed to facilitate the enactment of the design which in essence, was part of the overall aim of the blended learning environment (see figure 5.1) below. The enactment process model was inspired by Garrison, Anderson, & Archer's (2001)'s 'practical inquiry model' as design considerations for blended learning environments.

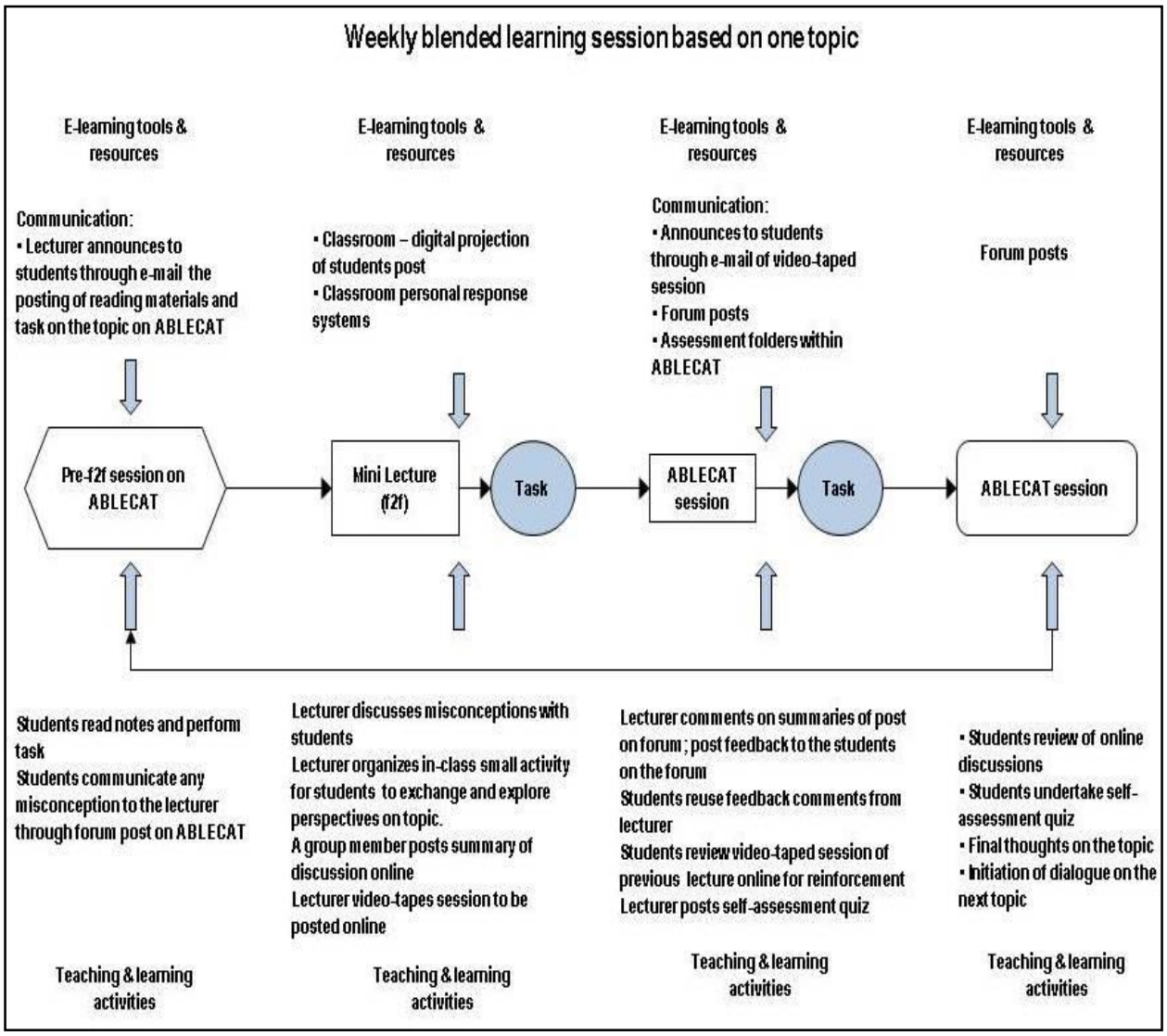

Figure 5.1: ABLECAT enactment process model

The practical inquiry model has been credited with increased effectiveness, efficiency and appeal in teaching and learning in higher education through reflective and collaborative activities, while providing unlimited access to information in a blended learning designed environments (Garrison & Vaughan, 2008). Although it is acknowledged that ICT could facilitate the expansion of

possibilities in teaching and learning by supporting various forms of communication, the design of the experiences and the mode of students' engagement are credited with directly affecting the quality of the learning experience which the practical inquiry model provides in a blended learning environment.

5.3.1 The enactment process

The Pre-f2f component of the enactment process model above provides the initiation of the weekly activity. Here, the main objective is to spur the students' curiosity and define the key tasks and activities for the students on the topic of the week. The sub-components in the pre-f2f include the provision for the students to undertake pre-reading and writing activity which is meant to 'jog' the students into taking the centre stage in the learning process. This is what Garrison & Vaughan (2008) refer to as "triggering events" and this stage is represented in the learning design sequence for this study as "*motivate*". This is facilitated by the provision of tasks and activities meant to test the students' understanding of the pre-reading and writing activity. The students are then offered the provision to communicate their misconceptions (if any) to the lecturer through the use of forums set up for each topic. Consequently, the students begin to take centre stage of the learning process and the line of communication between the students and lecturer is opened.

The second phase of the enactment process model involved the actual face-to-face teaching and learning. In this phase ICT tools and resources were provided to:

(i) help organise mini lectures and/or tutorials to address issues with regards to activities posted online earlier in the pre-f2f session;

(ii) promote dialogue between participants and the lecturer and among the participants about the specified issues on the topic;

(iii) organise small group activity in class

(iv) Video of the session to be posted online for the teaching and learning section of the model.

The use of mini-lecture as the previous main f2f meeting has now been referred to was meant to analyse the participants misconceptions (if any) of the pre-f2f assigned reading and writing activities. This then meant that the f2f sessions were no longer used for information transmission (lecturing) but an avenue to promote and provide dialogue between the lecturer and the students and among the students which hitherto, was non-existent.

This second phase of the enactment process provided an avenue for the use of an electronic projector to project the views of the students from the discussion forum as requested in the pre-f2f

session and for debriefing. This process was meant to promote or ginger debate among the participants and thereby increase collaboration and communication in the CS course which ultimately would improve their skills and knowledge in the course. Whilst simultaneously video-recording the activities in this mini-lecture, this phase also involved the setting up of small group activity in class to further elucidate on what the participants learnt in the f2f session.

The recorded video when posted online was meant to serve as an avenue for the participants to review what took place in the f2f session serving as reinforcement of the topic and also serve as a means of reaching out to the participants who might have inadvertently missed the mini-lecture. The small group activity served as a consolidation factor which is referred to as exploration and represented in the learning design sequence as "*explore*". Here, the mini-lecture and the small group activity were meant to help the students explore and exchange ideas on the new information received during the session with their prior learning experience (Garrison & Vaughan, 2008).

The third phase of the enactment model serves as an avenue for the students to reflect on the knowledge and skills that has been earmarked by the objectives of the topic. The activities here include the re-use of the lecturer's comments and the review of the video-taped session for reinforcement by the students. This is what has been referred to as the "integration" phase of the 'practical inquiry model' of (Garrison & Vaughan, 2008), represented in the learning design sequence as "*apply*". There was self-assessment quiz meant to provide an avenue for the students to apply their knowledge and skills on the topic. The application component makes use of e-mail for communicating to students of the video-taped session. The forum is used to provide an avenue for the students to read the feedback from the lecturer, and the assessment folders are used to record the results of the quiz session.

The final phase involved teaching and learning activities which included individual or group assignment posted online. This process enabled the students to see how well they understood the topic and the participants to compare their work with each other and to learn from each other. Finally, the participants are offered the opportunity to express their thoughts on the topic. This strategy was meant to improve knowledge construction and also set the tone of initiation of dialogue on the next topic. Garrison & Vaughan (2008) referred to this phase as 'resolution' in their practical enquiry model and it is represented in the learning design sequence as "*review/assess*".

ABLECAT performs the functions of content delivery, promoting communication and construction of knowledge by the students. The unidirectional arrows in the enactment process model show the students' interaction with the ABLECAT in each of the four components in the

model. Furthermore, the model illustrates blended learning teaching and learning situation for a course where both tasks and activities are used to enhance knowledge construction.

5.4 Factors influencing the effectiveness, efficiency and appeal of the pedagogical goal

5.4.1 Classroom Observation- Enactment Phase

The classroom observation, informal conversational interviews with students and the lecturer, and online activity logs of students were used to determine the factors that enhanced or inhibited the movement of the intervention towards the pedagogical goal.

To identify the content to be included in the field notes, classroom observation was undertaken at this phase of the study to be able to capture the whole teaching and learning event as it occurred in the setting of the CS context (Cooper & Schindler, 2006).For the period between the 17th October 2011 and 7th November 2011, these areas were documented through the use of the video-taped recordings at the mini-lectures.

Table 5-1: Summary of classroom observation at the enactment phase

Object for Observation	Description	Observations
Space	The physical setting where the CS course took place	A new larger theatre was used with the same number of students as the pre-intervention phase. The room could comfortably accommodate the students
Actors	The students and the lecturers in the CS teaching and learning session	The same lecturer and the same class of students.
Activities	Sets of related acts taking place during the teaching and learning sessions of the CS course;	Students discuss their misconceptions and the lecturer responds to their concerns.
Objects	Artefacts and physical things available in the space facilitating the teaching and learning process	White board and markers where the teacher occasionally writes for emphasis. There was also the use of electronic projector and a video recording.
Acts	The specific actions of the actors in the course of the session	Students attended lectures with prepared questions and comments and references from material sourced from ABLECAT
Events	The sets of activities that took place in the course of the observed session	Students were divided into discussion groups. Used SRC constructed pavilions with access to Wi-Fi. Some students helping group members with difficulty

		of accessing online materials
Time	When specific sequence of acts, activities and events took place that impacted of the teaching and learning session	Class started at 5 pm and ended at 8 pm with 1 hour pre-lecture group discussions
Goals	The efforts of the actors to achieve the learning objective of the session.	Enhanced engagement between students and lecturer. Lecturer gains attention of students through the provision of pre-lecture reading materials
Feelings	The feeling of the actors as they expressed them	Not enough time for the lecturer to respond to all the technical support requests, the forum was difficult to e-moderate

The observation was meant to characterise the *where, when*, *how* and *why* of the mini-lecture. The table 5-1 above is the summary of the presentation of the observation in the classroom at the enactment phase of the intervention. The observation was carried out to assess how the lecturer discusses with the students their misconceptions about the pre-f2f assigned reading and writing activities and whether this generated dialogue between the lecturer and the students. Also observed was how the video-recording of the mini-lecture affected the teaching and learning situation as well as the students' utilisation of the small group activity.

Figure 5-3: Classroom Observation at the Enactment Phase

The mini-lecture took place in a new lecture room large enough to accommodate the entire students involved in the experiment, albeit uncomfortably from 5pm to 8pm once a week. This time the lecture theatre was equipped with computers connected to the internet. It was noted that some of the students come to the mini-lecture with a list of questions and comments that they have written down to make. This happened, when after a brief introduction by the lecturer, the students started seeking clarifications from the reading materials. Some of the students were also making references to portions of materials they have sourced from other websites to make their comments. Again in the course of the mini-lecture it was found that some of the students have logged on to the course website and were sourcing for information to contribute to the discussion.

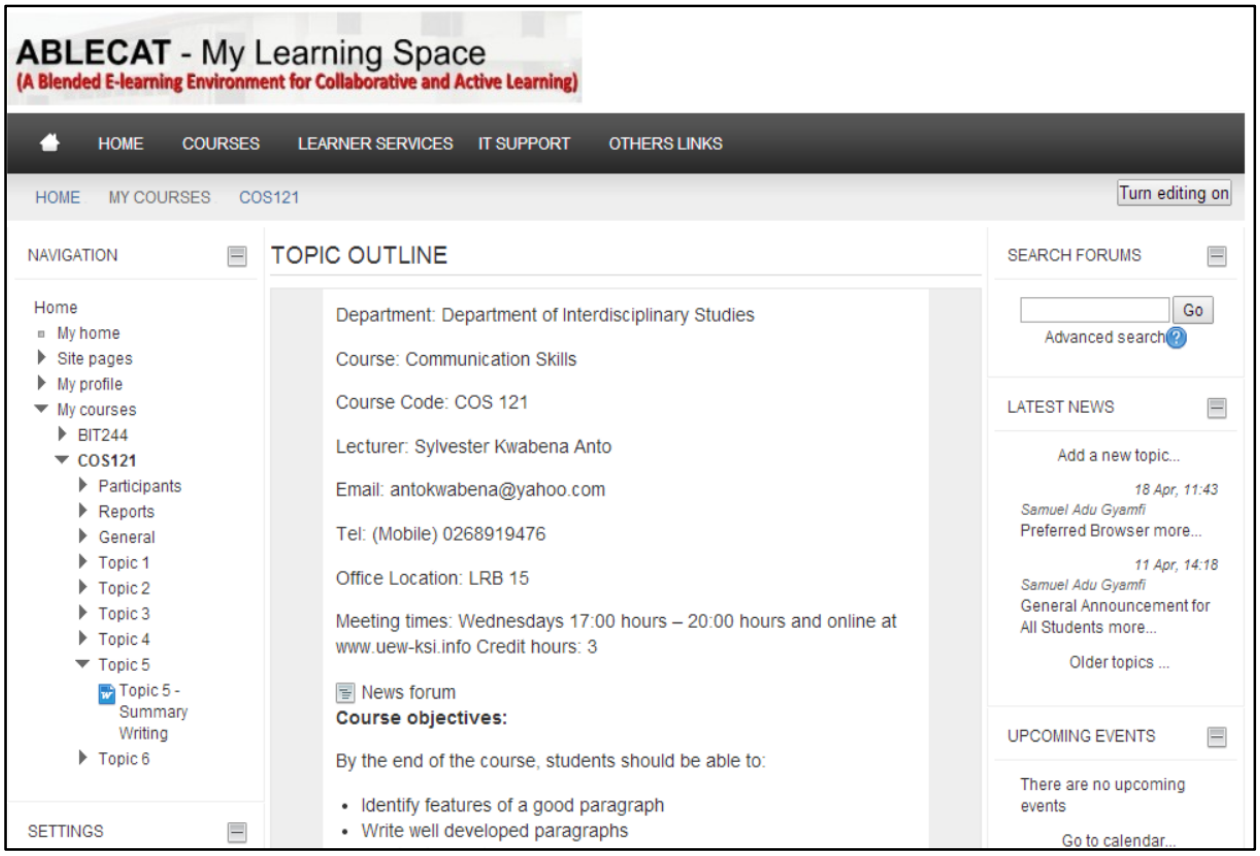

Figure 5-4: Students Access to Course Materials

The lecturer made clarifications to the comments and questions that came from the students, since a few of the students have sent some of them through the forum post which the lecturer had already seen. When it came to the small group activity, it was suggested that due to the inadequate space available in the lecture, the small group activity could be better held in the SRC constructed pavilions. These would provide a convenient place for the students to express their views without

disturbing other groups. Time schedules of one hour before the week's lecture begins, were proposed and accepted for these small group activities. During visits to these pavilions, it was found out that apart from being able hold the group discussions under these pavilions some of the students were able to access information from the course website through the university's Wi-Fi. Other students with very good ICT skills were also found tutoring a few ones who were having difficulties with the use of the online learning environment.

The students' preparation and participation in the mini-lecture sessions suggested that the lecturer has gained their attention, hence their engagement in the CS course. Students' engagement has been described as the time and energy students devote to educationally sound activities inside and outside of the classroom, and the policies and practices that institutions use to induce students to take part in these activities (Kuh, 2003. By incorporating the pre-f2f readings to the course delivery through the online learning environment, the students' motivation level was aroused due to the varying elements of instructions they were receiving for the first time. Students' motivation and engagement in the CS course therefore, served as one of the enhancement factors of the intervention.

In order to respond to numerous requests for technical assistance, respond to students' postings on the forum, and organise and monitor mini-lecture and small group activities require time and electronic moderating (e-moderating) skills of the lecturer. Due to the demands (and inflexibility) of the curriculum, the lecturer could not find enough time to become thoroughly familiar with the software or to spend time online with the participants. The lecturer, because she was accountable to the students and the university administration in general, was understandably unable to 'risk' taking too much valuable time on an essentially experimental project, even though the university administration had granted permission for the research study. Lack of time therefore, became an inhibiting factor in the intervention.

5.4.2 Informal Conversational Interviews- Enactment Phase

As a follow-up to the classroom observation, informal conversational interviews were conducted with both the students and the first semester lecturer of the CS course to gather information about the factors influencing the effectiveness of the intervention towards the achievements of the set pedagogical goals. The informal conversational interviews were used to validate the observations and to explore deeper into the motivations of the respondents and their reasons for responding as they did (Cohen, Manion, & Morrison, 2007).

Table 5-2: Summary of the responses from the Students and the Lecturer

Parameters	Responses	
	Students	**Lecturer**
Mode of Teaching	Lecture , Discussions and group activities	Lecture , Discussions and group activities
Setting	Lecture Theatre with Internet Connected Computers	Lecture Theatre with Internet Connected Computers, ABLECAT website
Course Texts and Material	Online materials, videos, and digitized course materials	Online materials, videos, and digitized course materials
Teaching materials	Board and Markers, Electronic projector, Computers	Board and Markers, Electronic Projector, Computers
Mode of Assessment	Online feedback, posts on forums and small group assignments	Emails and the forum posts
Interaction	Occasional classroom discussions, small group activities, forum	Occasional classroom discussions
Use of ICT tools	Yes	Yes
Evidence of impact of intervention	Came to class prepared, with questions and comments on notes	Students asked questions in class and answered questions, students came to class prepared
Feedback	Yes, Lecturer answered questions posed in forums and assessed online activity	Yes, assessed students' online activity. Monitored students contribution online
Problems identified on the new learning environment	Activities not part of continuous assessment. Slow Internet connectivity affected access to video lectures; High cost of Internet access outside the school , Challenges with email accounts,	Some students tended to use materials downloaded by friends, Students complained of not receiving emails, Slow internet connectivity affect students use of the learning environment
Benefits Identified in the new learning environments	Access to course materials and teaching activities anytime anywhere. Reminding colleagues on new postings, acquisition of new ICT skills	Students' contribution in class, interests in group activities and students motivated. Taking control of the learning process by students
Suggestions for improvement	Emails should be improved, expansion and increased speed of the Internet connectivity. Make online activities part of continuous assessment towards course grade.	Increase in the bandwidth and speed of the internet, training to respond to students' technical needs and readily availability of the technical staff to support students. E-mailing systems of the interventions should be improved.

5.4.2.1 Informal Conversational Interviews with Students

From the interviews, it was discovered that a few of the students who accessed the website regularly were able to get information on the postings of course materials and activities for the week. They in turn, informed their colleagues to undertake the activities that were posted on ABLECAT. It was also learnt that a few of them could actually post on the forum that was set-up for the weekly topics and some of the students were able to utilise the provision that was made for the pre-f2f session. Following is an extract from the interview with one of the students:

> "The course website is very useful to me because I never found any problems with any activity I did on the site. I download almost all the notes that are uploaded on the website and use them at home because it is expensive online for a long time"

The provision of the learning materials in various formats on ABLECAT, therefore served as an enhancement factor for the students' assimilation, comprehension and reproduction of the various topics in the course. In addition to providing the students access to learning materials at any time and at any place the blended learning environment afforded the students greater autonomy and insight into their own learning process.

However, it was found from the interviews that the students perceived the activities as not part of the continuous assessment marks which eventually form part of their end of semester grades. This therefore, did not provide the students the incentive to actively participate in the online activities after a while. Knowing that the activities did not form part of the final grading, most of the students began to neglect them. The students' inability to undertake the activities became an inhibiting factor for the intervention, because it suggested a break in the chain of the cycle of the design of ABLECAT

Additionally, information from the interviews with the students indicated that some of them were facing some technical challenges in accessing ABLECAT.

First, there was an issue with the e-mail system used in the enactment phase. Most of the students complained that they did not receive any correspondence in their mail with regards to the announcement of the online postings of materials. They could also not send e-mail to the course lecturer to report the problem or to the learning environment administrator.

Secondly, most of the students could also not access the video-recorded lectures from the mini-lecture sessions. They found out that either the video files were too large to download and play back or the Internet service on campus was too slow to facilitate the download of the videos. Interactivity in the form of CMC has been found to be one of the essential characteristics of online

learning since the use of these communication tools enable learners to interact with experts, teachers and peers and hence, the experts and teachers become more reachable and knowledge becomes more available.

Technically, Moodle, the platform on which ABLECAT was built, supports the creation and use of e-mail. What is required is the appropriate technical knowhow to incorporate client e-mail with the e-mail addresses generated for the students. On the official e-mail to the students, Internet access from the University of Education, Winneba is done through a proxy server. Technically, it became difficult to access the *c-panel* pages from Moodle of other servers through the university server. As a result, the initial e-mails that went through the *c-panels* of Moodle could not be accessed by the students from campus. This technical hiccup resulted in the inability to reach the students with the planned announcements through e-mails for the posting of reading materials and tasks as well as the posting of the video-taped sessions. The campus radio was therefore, used to announce to the students the postings of the reading materials and tasks. This process was also disadvantageous to the students who did not have radio sets. The non-resident students were also disadvantaged in this process because they might be out of campus during the time the radio announcements were made. Therefore, this lack of communication to the students on what to do and expect from the lecturer on the ABLECAT demoralised some of them. The absence or the non-functioning of the e-mail service on ABLECAT therefore, became an inhibiting factor.

5.4.2.2 Informal Conversational Interview with the Lecturer

The informal conversational interview with the lecturer seems to confirm the students' motivation and engagement with the introduction of ABLECAT. This is reflected in the following extract from the response from the lecturer; "My problem with students in this course has always been the inability or unwillingness of the students to make comments and contributions in class. This batch of students has been exceptional. The students always ask for clarifications, make comments and useful contributions in the mini-lecture sessions"

Through the informal conversational interview, the lecturer suggested that she could not otherwise have been able to manage the use of ABLECAT in the lectures on her own. Preparation of lecture notes, task and activities, capturing of video lectures, uploading of materials on to the course website and troubleshooting of occasional hiccups of the functioning of the website received collaborative support from the instructional designer and the university web designer. Thus, the cost of time and resources that could have been expended on them was avoided.

5.4.3 Students' Activity Logs

From the second week of the intervention, the students' activity logs on ABLECAT were checked to determine the activities of students in order to assess their use of ABLECAT. Records of students' logs on ABLECAT indicated that most students were able to access the course readings and notes and the activities at the pre-f2f stage (see figure 5-5). This suggested that the Moodle platform was relatively intuitive for the students who were familiar with common browsers and similar web pages. The students' activity logs also pointed to a suggestion that when there was no task or activity assigned to the week's topic, logs on course reading materials were very low Additionally, only a few of the students made postings on the forum as well as accessed the video-taped lectures. This corroborates the informal conversational interview with the students when they suggested that they could not access the video files because of network problems.

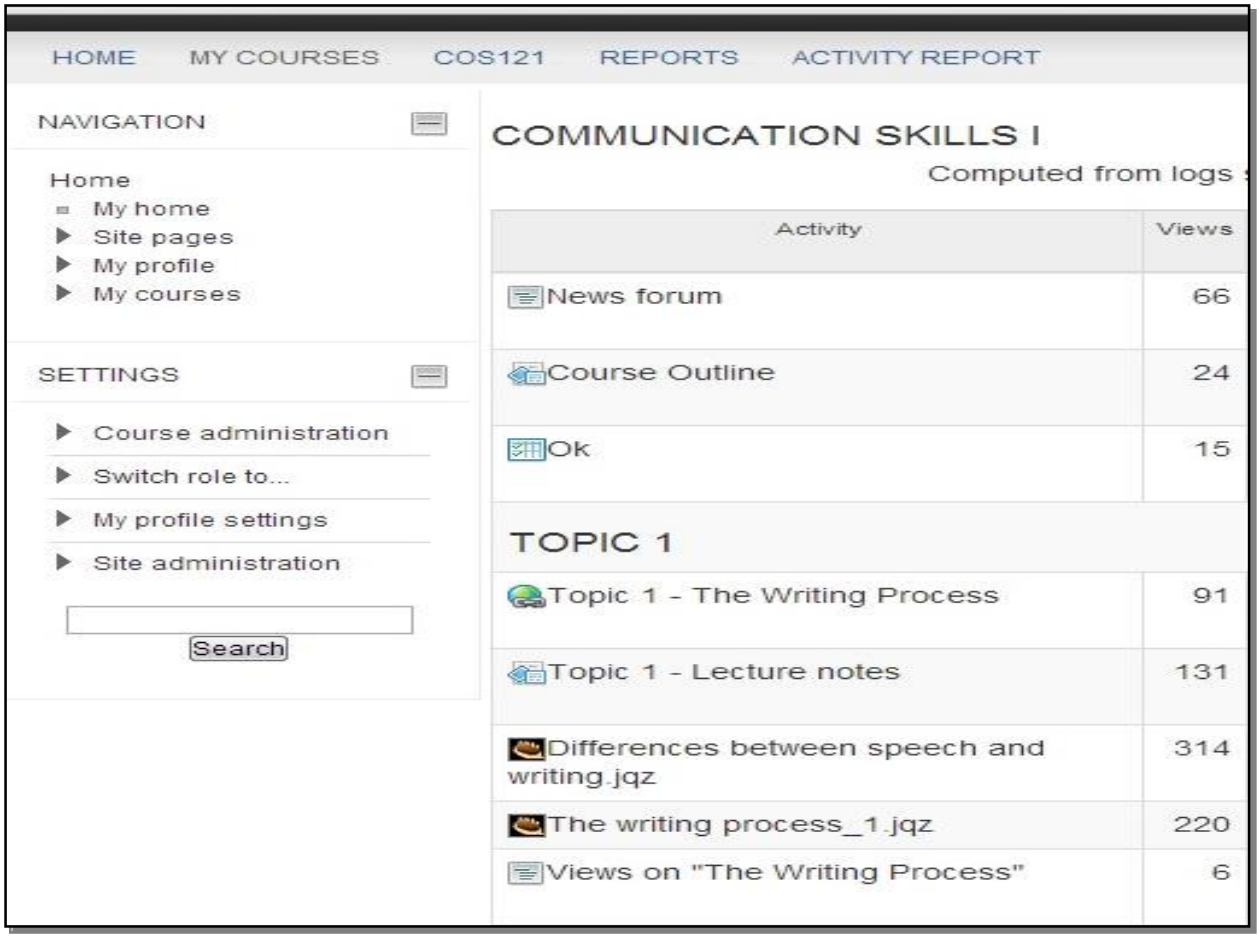

Figure 5-5: Students Activity Logs

In sum, the descriptive analysis and reflection on the data that was gathered at this stage was to determine which practices in the instructional environment that needed to be discontinued,

adapted or transformed to achieve the pedagogical goal. The following enhancement and inhibiting factors were identified from the analysis:

- The development of ABLECAT was a collaborative effort of the researcher, the lecturer, the instructional designer and the web designer. This collaborative effort suggested an enhancement factor for the achievement of the pedagogical goal of the intervention. Students' motivation and engagement in the CS course served as one of the enhancement factors of the intervention; the provision of the learning materials in various formats on ABLECAT, also served as an enhancement factor for the students' assimilation, comprehension and reproduction in the course.
- The students' inability to undertake the activities became an inhibiting factor for the intervention, because it suggested a break in the chain of the cycle of the design of ABLECAT. The non-functioning of the e-mail service on ABLECAT, became an inhibiting factor since the proposed interaction between the lecturer and the students could not take place.

5.5 Modification and Implementation of Modified Intervention

According to Reinking & Bradley (2008) in formative experiment, enhancement and inhibiting factors on the effectiveness, efficiency and appeal of an intervention must be identified and explained. This would enable the intervention to be modified accordingly to capitalize on the enhancing factors and neutralize the inhibiting factors. This section is therefore, used to address the fourth question of the methodological framework: "How can the intervention be modified to achieve the pedagogical goal more effectively and efficiently and in a way that is appealing and engaging to all stakeholders?"

5.5.1 Adaptations to the intervention

The inhibiting factors enumerated in the previous section impacted on the intervention, so the implementation of the intervention was adjourned after the fifth week lectures while the course itself continued. The lecturer used the usual face-to-face meeting and the lecture-discussion method. The contents and materials on ABLECAT were however, available for the students for reference whenever needed. In this way, ABLECAT provided one of the numerous advantages that online learning provides. First, the learners never lost their work unless it was purposefully or inadvertently

deleted. In addition, since all the students' learning processes and the lecturer's contributions were recorded on ABLECAT, the students could easily refer to them when and wherever they need them. Consequently, ABLECAT offered the participants to engage in what could be referred in literature as self-directed learning (Davidsen & Georgsen, 2010)whilst the implementation was in adjournment. The adjournment of the implementation was to find suitable ways of making the intervention more effective in addressing the pedagogical goal.

First, the problem with the e-mail had to be fixed to restore the e-mail communication with the students at the pre-f2f session. This was planned to offer and promote interaction between the lecturer and the students in the design. Interactivity in the form of both synchronous and asynchronous communication was found to be essential for the success of the intervention from the data analysis of the enactment phase. The effective functioning of the e-mail in ABLECAT would therefore, serve to reach all students irrespective of where they might be when the announcement of the posting of reading materials and tasks to be performed is made. The students could also communicate with the lecturer more easily and frequently. Their misconceptions would therefore, be communicated faster and dealt with earlier than the former practice (f2f lecture).

Since the initial e-mails went through the c-panels of the Moodle platform, the students could not access them from the university campus' server. A Gmail account was therefore, provided which they then, could access. In the case of the Gmail, what the web designer did was to create a list serve account using individual emails of all the students. Therefore, each student was asked to create a new e-mail account with Yahoo! or Google (for example, ***Gmail, ymail*** or ***yahoo mail***).

Secondly, an arrangement with the head of department and the new CS course lecturer for the second semester require that the students activities in ABLECAT covering the tasks that the lecturer would set for the students at the pre-f2f session, the group activities as well as the coursework assignments should be scored and included in the final assessment grade of the students. The inclusion of task in the learning environment is to ensure:

(i) an emphasis on learning to communicate through interaction in the target language;
(ii) the provision of opportunities for learners to focus not only on language but also on the learning process itself;
(iii) the linking of classroom language learning with language use outside the classroom (Nunan, 2004).

The realisation of these principles and practices on the CS course therefore, strengthens the need to include the task on ABLECAT during the pre-face-to-face sessions. Thus, the mandatory

incorporation of coursework and assignments in the design of ABLECAT was to monitor the students' progress in the CS course and to modify the mode of instruction accordingly

Again, aside the fact that students prefer course work assignment to examinations and consider coursework to be fairer than examinations, coursework marks have been found to be one of the better predictors of long term learning of course content than examinations (Gibbs & Simpson, 2004). Furthermore, the inclusion of the coursework marks in the final assessment grade was envisaged to motivate the students to take part in the tasks and activities in ABLECAT and thus, ultimately improve their skills and knowledge in the CS course.

The second recommended change in the redesign of ABLECAT was therefore; supposed to, aside the aforementioned objectives motivate the students to perform the tasks that were included in the pre-f2f readings so that they could post their misconceptions on the forum to enable the mini-lecture to take place as designed on ABLECAT. By taking part in these tasks and activities, the proposition in the design of ABLECAT was that it would improve the students' knowledge and skills in the CS course.

Very often, the speed at which lectures are presented in the lecture room, the sort of vocabulary that might be used and other impeding factors in a lecture room, pose some difficulties for second-language learners (Smidt & Hegelheimer, 2004). The provisioning of online videos in ABLECAT was to provide the students' not only with control over what was said and how it was said in the video, but also with access to additional resources and activities. Online videos have been documented as one of the learning materials that serve a dual purpose of helping non-native learners understand the content and learn the language (Collins, 1999; Smidt & Hegelheimer, 2004).

Therefore, a new way of presenting the video-recorded lectures on ABLECAT was devised to help the students acquire the requisite knowledge and skills in the CS course. The lecturer's comments on the students' postings on the pre-f2f session would be videoed in his office and posted on the course site as feedback for students. The lecturer would add explanations on the students' misconceptions as well as further comments on the topic. This would be a shortened video of about twenty minute's duration. The size of the video file would then be smaller, which would also allow for easy download and streaming considering the low bandwidth the students were faced with on campus. This approach would also eliminate the situation whereby the lecturer's 'slip of tongue' (if any) might be edited before the video is posted online. This change in the production of video-recorded lectures would also improve the sound quality of the videos. Hitherto, since the

videos had been recorded in the large lecture rooms, noise from adjacent lecture rooms always filtered into the recordings.

5.6 Implementation of the second cycle of ABLECAT

With these changes, a few modifications were made to the enactment model to enable an effective implementation of ABLECAT in the second semester of the 2011/2012 academic year. In the new enactment model the only change that affected its implementation plan was the schedule of the video-recorded lectures which is now found in the third phase of the model. All the enactment processes remained the same.

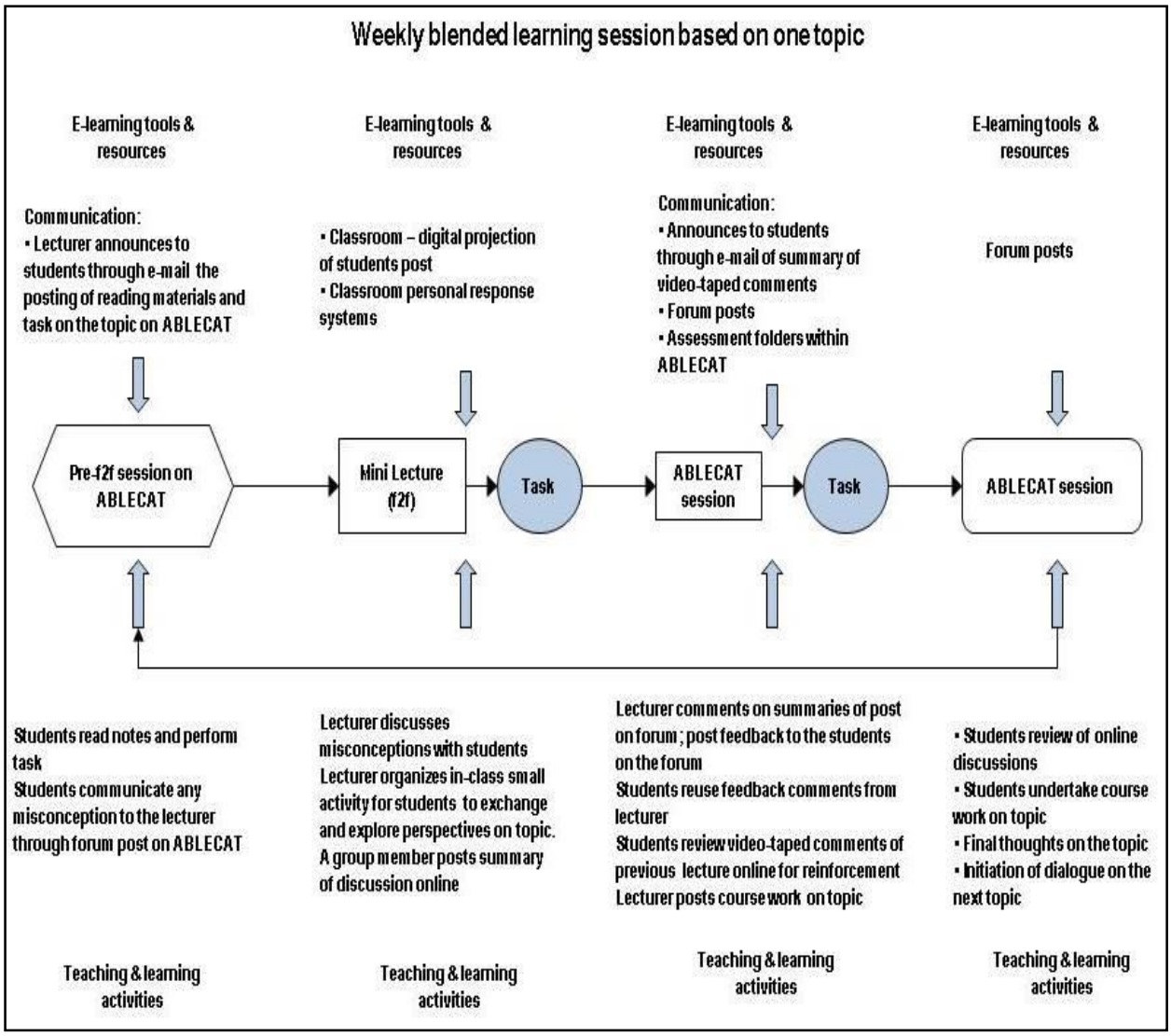

Figure 5-6: Modified ABLECAT enactment process model

With these changes in place, the modified ABLECAT was re-enacted with the same students in the second semester of the 2011/2012 academic year. The re-enactment started from the week ending 9th March, 2012 through to the 20th of April, 2012, a period of seven weeks. The semester also involved the second phase of the CS course. This second cycle phase of the implementation of the intervention was also used to gather data that could help identify and seek explanations for unanticipated effects and outcomes. At this phase, informal conversational interviews and the students' online activity logs were used to gather information.

The students' online activity logs was used to examine and determine the frequency of the students' use of ABLECAT in terms of pre-f2f sessions, the use of the video-recorded lectures, performance of assigned activities, and postings on the forums.

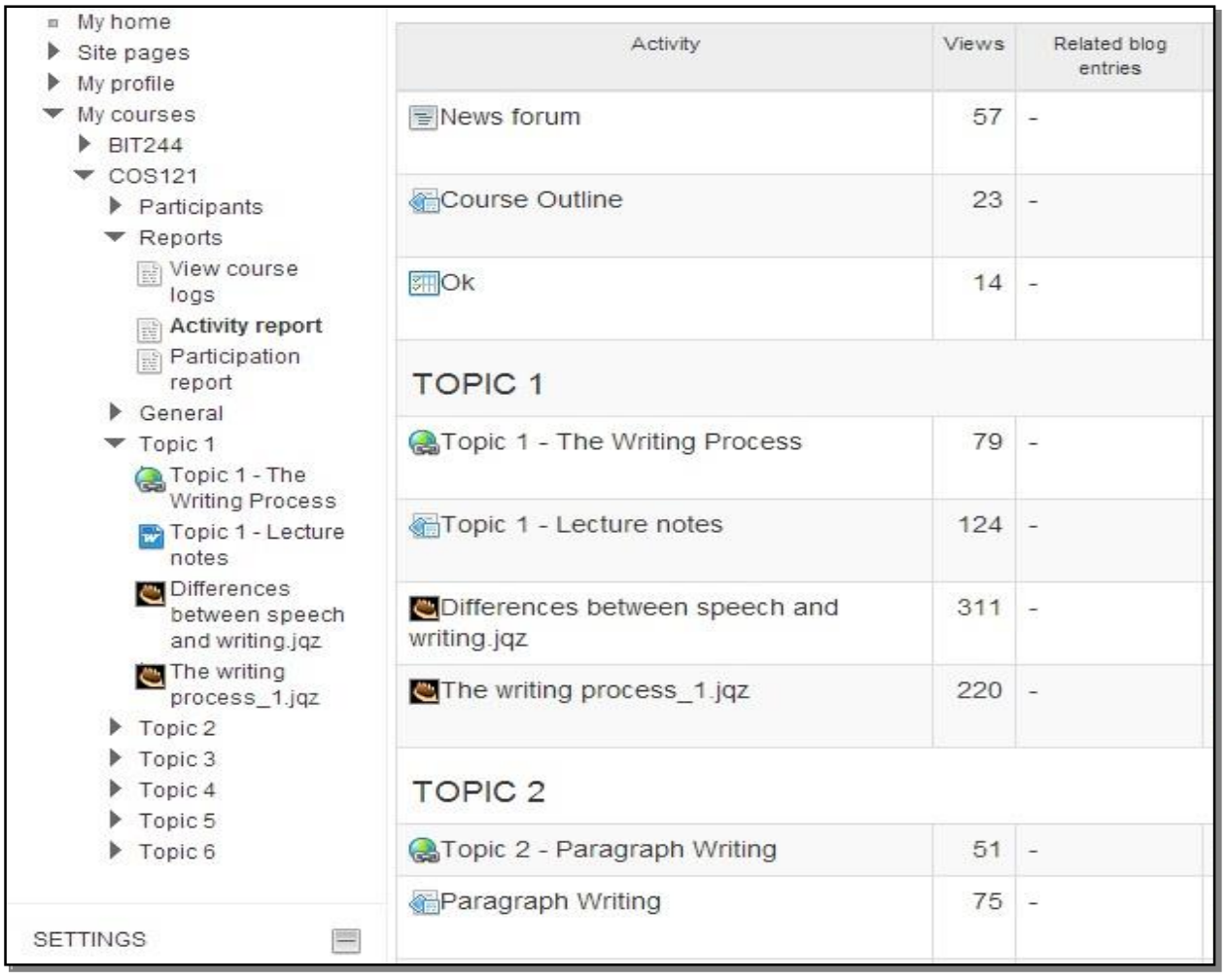

Figure 5-6: Student Activity Logs in the Second Cycle of implementation

The information that was gathered from activity logs of the students (n=75) on ABLECAT showed that, 57 of the students viewed and or made postings on the first task to the forum that was

created for the topic (see figure 5-7). It was gathered from the activity logs on ABLECAT that there were 124 views or readings of the lecture notes that were posted by the participants on the first topic and 311 attempts or views by the participants on the task and quiz that was set for the topic. The trends in the data show that it is probable that the communication with the students has been established through the use of the e-mail to announce the course topic and the task assigned to the students. This goes to meet one of the reasons for the use of the e-mail in the design of ABLECAT that is, establishing the initial interaction between the lecturer and the students which could also make the lecturer become more reachable to the participants (Ogata & Yano, 2004). The positive responses on the task that was set for the topic could therefore, enable the mini-lecture to take place effectively as envisaged in the design of ABLECAT.

In the informal conversational interviews of the students, the reaction to the changes made in the second phase was sought whether it meets their expectations especially with regards to the new format of the video-taped comments and explanations of the lecturer. The opinions of the students were also sought on whether any adaptation ought to be made to the intervention or any additional modification should be made to the intervention. In the case of the lecturer, his impressions with regards to the introduction of the changes made in respect of the incorporation of the assignment and activities as part of the students' end of course grades, and how that has translated into the students' learning was also sought.

Table 5-3: Summary of opinions from informal conversational interviews in the second cycle implementation of the Intervention

Parameters	**Students**	**Lecturer**
Impact of the modified email system	Use email to initiate interaction with course lecturer	Use email to provide students feedback and response to questions and concerns
Modified video format and size	Improved download , videos are short and to the point	Video recording environment has improved and the time needed for recording has been shortened
Knowledge of the incorporation of scores of online activities	This is motivating and driving the use of online activities and group activities	Student participate better in online activities and face to face group activities

The responses from the students suggested that most of them used the e-mail for initiating interaction with the course lecturer since it was a preferred and familiar mode of communication. The responses also suggested the usefulness of ABLECAT in initiating them to take responsibility for their own learning from the onset of the topic for the week. This initial phase therefore, served as one of the avenues to get the students involved in the course, potentially helped assess the state of knowledge and skills of the students on the topic as well as probably generated unintended but constructive ideas from the students.

The students' responses from the conversational interviews suggested that they usually proceeded to view the video-taped comments of the lecturer and subsequently performed the coursework/assignment for the week on ABLECAT. They suggested that the comments helped to shed more light on some of the areas they could not understand during the mini-lecture. Some of the comments of the students suggested that they used the video-recorded comments as reference source in looking for answers for their coursework and assignments. This is reflected in the following extract from the interview with one of the students:

> "I always find that sometimes the lecturer's comments in the video were more detailed and perhaps more useful for reflection than the discussions we usually have in the classroom"

This 'integration' phase of ABLECAT suggested that the students' learning of the CS course was more focused and structured. This further suggested that they were able to construct meaning by integrating ideas from the pre-f2f session through the mini-lectures to the integration phase of the enactment process.

On the part of the lecturer, the informal conversational interview with him took place at his office at the time when the video recordings of his comments take place on the topic for the week. Due to the fact that the video recordings had to be flawless, it was decided that the presentations had to be read from a prepared script. In view of that, any 'slip of tongue', or mispronunciation of a word or any mistake by the lecturer would cause a repeat or re-recording of the comments. The recordings therefore, needed practice, time and effort to get them done perfectly. The lecturer therefore, summed up the above in the following extract from the informal conversational interviews

> "Initially, I thought the video recording was going to be fun and simple. I realise I needed time to prepare the scripts, read them over and over to get acquainted with

> the script, and a lot more effort and time to get them recorded. I have also realised that if you want to undertake this mode of instruction, you need to find additional time to deal with the students' postings on the forum, respond to the students' e-mail messages and prepare the comments and summaries to post them online. This could pose a challenge and also have a toll on your other professional duties and social life"

However, despite the time and effort that was needed to attend to the students' needs in the blended learning environment, the responses of the lecturer in the informal conversational interview suggested that the use of the coursework and assignments as part of the end of semester grades of the students was having an impact on the students' learning of the course. He explained that, unlike the previous students he handled in the course who hardly asked questions and made comments in class, the current session of students made contributions and comments in class often leading to a healthy exchange of ideas. The lecturer also commented that attendance in class sessions have improved as compared to the previous years. This suggested that the students have been motivated by the introduction of the blended learning environment approach.

5.7 Summary

In this chapter, the enactments of the intervention have been discussed with the identification of some enhancement and inhibiting factors during the intervention phase. Due to the inhibiting factors that cropped up, the use of the intervention was adjourned. The chapter also discussed the extent to which the intervention was modified and implemented to achieve the set pedagogical goal. The qualitative data indicated that the design and implementation of ABLECAT impacted positively on the students in the teaching and learning processes of the CS course. The enactment process model has been used to explicate the findings from the informal conversational interviews with the students and the lecturer as well as the use of the students' online activity logs.

Chapter 6

6 Post-Intervention (ABLECAT) Analysis

6.1 Introduction

Formative experiments require the collection of data identifying conditions under which an intervention work or otherwise in order to develop theory and or improve practice (Reinking & Bradley, 2008). At this phase of the analysis of the intervention a researcher-designed questionnaire was used as a survey instrument to gauge the students' perceptions of the use of the intervention. Secondly, an exit performance test to be compared with the baseline performance was conducted.

6.2 Perception of students on the use of ABLECAT

At the end of the formative experiment period, a researcher-designed questionnaire was administered to ascertain the students' perceptions on the use of ABLECAT. The questionnaire sought to find out from the participants their perceptions in terms of the quality of the content, learning, communication and the level of engagement they experienced in ABLECAT. Part of the questionnaire was selected to explore the research propositions that underlie the design of ABLECAT (see Appendix D).

Sixty-four students answered the Likert-type questionnaire consisting of 11 statements with the options to state their agreement on a scale of 1 to 5 (strongly agree, agree, neutral, disagree and strongly disagree). The tables below present the results of the three design propositions questionnaire. Statistical Package for Social Sciences (SPSS v.16) software was used to perform a descriptive analysis of the data obtained from these quantitative instruments.

Table 6-1: Responses on Design Proposition One

Multiple learning resources on ABLECAT would sustain learners interest and promote cognitive engagement in CS	Strongly Agree %	Agree %	Neutral %	Disagree %	Strongly disagree %	Std. D	Mean
Item							
1. The learning materials on ABLECAT explain the concepts in CS very well.	40.6	40.6	10.9	3.1	4.7	1.03	1.91
2. The learning materials on ABLECAT were relevant to the needs of the CS course.	46.9	39.1	9.4	0.0	4.7	0.97	1.77
3. ABLECAT was a very useful extra source of information and resources for the CS course.	39.1	43.8	10.9	4.7	1.6	0.91	1.86
4. The learning resources on ABLECAT enabled me to gain good understanding of each lecture before attending them.	26.6	46.9	17.2	3.1	6.2	1.06	2.16
5. The learning resources on ABLECAT enabled me to revise more effectively.	35.9	48.4	7.8	3.1	4.7	1.00	1.92
6. The learning resources on ABLECAT helped me to perform better in assignments/course work	32.8	39.1	18.8	6.2	3.1	1.03	2.08

Most of the students (more than 80%) perceived that the learning materials on ABLECAT explained the concepts in CS very well and were therefore relevant to their needs (see table 6-1). Apart from perceiving it as being very useful extra source of information and resources for the CS course, majority of the students perceived that ABLECAT enabled them to gain good understanding of the topics before attending the mini-lectures. Moreover, most of the participants (more than 70%) perceived that ABLECAT helped them to perform better in assignments and coursework. The availability of the course resources and materials on the learning intervention or ABLECAT provided the students with learning resources in multiple formats 24/7 and offered them with greater choice in the topics they are to study, how to explore the topics and consequently how to represent their understanding of the topics. It can therefore be concluded that the provision of multiple learning resources in the design and implementation of ABLECAT contributed to the positive perception expressed by the participants in the survey.

Table 6-2: Responses from design proposition 2

Provision and use of communication tools on ABLECAT would encourage learners' collaboration and promote their cognitive engagement in CS	Strongly Agree %	Agree %	Neutral %	Disagree %	Strongly disagree %	Std. D	Mean
Item							
1. ABLECAT has improved the communication I had with the lecturer	20.3	59.4	15.6	4.7	0.0	0.744	2.05
2. I felt discussions with my colleagues in the forums on ABLECAT helped me understand the course content on CS.	23.4	45.3	23.4	4.7	3.1	0.957	2.19

Table6-2 shows that more than 70% of the students perceived that ABLECAT has improved the communication they had with the lecturer. Again most of the students (more than 68%) perceived that ABLECAT has helped them to understand the course content on CS due to the discussions they were able to have through the forums on ABLECAT. There have been claims that computer-mediated communication (CMC) – both synchronous and asynchronous, is the most revolutionary development in computer-assisted language learning, since it is the only one which involves direct human-to-human communication rather than human-to-machine (Warschauer, 1996). It could therefore, be deduced from the responses of the survey that the provision and use of the communication tools in the design and implementation of ABLECAT contributed to the collaboration that the students perceived to have enjoyed. Collaboration among the students therefore, encouraged their motivation in the CS course, and hence their enhanced cognitive development and improvement in the CS course as well.

Table 6-3: Responses from design proposition 3

Learning tasks and coursework assignments on ABLECAT would engage and build learners' understanding and use of concepts in CS	Strongly Agree %	Agree %	Neutral %	Disagree %	Strongly disagree %	Std. D	Mean
Item							
1. Discussions on the forums helped me understand the course content better.	17.2	46.9	18.8	15.6	1.6	1.00	2.38
2. The quizzes and coursework on ABLECAT were very helpful for my understanding of the concepts in CS	40.6	37.5	10.9	9.4	1.6	1.022	1.94
3. The feedback/answers I received on the tasks/quizzes were very helpful in the CS course	37.5	37.5	15.6	6.2	3.1	1.039	2.00

The students' responses in table 6-3 show that more than 60% agreed that discussions on the forum on ABLECAT helped them to understand the course content better. More than 80% of the students agreed that the quizzes and coursework on ABLECAT were very helpful for their understanding of the concepts in the CS course. Furthermore, more than 70% of the students agreed that the feedback/answers they received on the tasks and quizzes were very helpful in the CS course. Feedback has been found to be central to learning and improving performance, and therefore, students need appropriate feedback on performance to benefit from courses. It has also been observed that if coursework is taken away from a course due to resource constraints, students do not do associated studying. It could therefore, be deduced from the participants' responses that the learning tasks and coursework assignment provided on ABLECAT engaged and built their understanding and use of the concepts in the CS course.

6.3 Comparison of the Pre and Post-Intervention Tests results

In section 6-2, the quantitative data pointed to a suggestion, that the participants perceived the design and implementation of ABLECAT as a platform that offered them an avenue to improve on their knowledge and skills in the CS course. In order to confirm or otherwise, the findings in the above data analysis, a post-intervention test was conducted to compare the results with the pre-intervention baseline performance test results.

The comparison of the data from the pre- and post- intervention test was to address the research objectives, that is, to establish;

(i) Whether overall, there has been a significant improvement in the performance of the students in the CS after the implementation of the intervention.

(ii) Whether there is a significant improvement in the performance of the students in the components of the assessment, that is, *organization, content, expression*, and *mechanical accuracy* competencies in a written communication test of the CS after the implementation of the intervention.

The *exit* written communication test was administered in the last week of the semester (20/04/2012). Sixty-nine participants out of the 75 who registered for the CS course took part in this post-intervention assessment test. The basis of the assessment of the post-implementation exit test was the same as the pre-implementation baseline test, that is, *content* = 30%; *organisation* = 20%; *expression* = 40%; *Mechanical Accuracy* = 10%. Each participant's script was photocopied, and the two CS lecturers marked the scripts. The marked scripts were then given to the head of the department

who moderated the final scores for each aspect of the post-intervention test. The moderated scores for both the pre-intervention and the post-intervention for each participant were analysed using SPSS (v16).

6.3.1 Description of the data analysis technique: Paired Sample T-test

Since the essence of the analysis was to examine whether there has been an improvement in the overall performance of the students as well as in the four components of the written communication test of CS (that is – *Organisation, Content, Expression and Mechanical Accuracy*), the appropriate statistical tool used to analyse the test was the Paired Sample T-Test (Cooper & Schindler, 2006).

The Paired-Sample T-Test procedure compares the means of two variables for a single group. The procedure computes the differences between values of the two variables for each case and tests whether the average differs from zero (Greasley, 2008). The basic idea is that if the intervention has a significant effect, the mean of the post-test should be significantly higher than the mean of the pre-test. Thus, the difference between the two means should be significantly greater than zero (Pallant, 2005).

The results of the paired sample t-test in terms of descriptive statistics and significance of the differences in the means for the pre-intervention (pre) and post-intervention (post) are presented in the following sub-sections.

For this analysis, the differences between the means of the pre-test and the post-test are examined, as well as the significance of the mean differences.

6.3.2 Analysis of overall student performance (pre-intervention and post-intervention)

The descriptive statistics for the overall student performance at the two stages are presented in 6-4 below.

Table 6-4: Descriptive statistics for overall students' performance at pre-test and post-test stages

Pairs	Item	Mean	Std. Deviation	Std. Error Mean
Pair 1	Class score at Pre-test	42.56	11.25	1.35
	Class score at Post-test	64.57	9.93	1.20

N = 69

Table 6-4 indicates that the overall mean for the class scores for the post-test (64.57) is greater than the overall mean of the class scores for the pre-test (42.56) of the written

communication test. The standard deviation of the mean score in the pre-test (11.25) is higher, widely spread more than the standard deviation of the mean class score in the post-test stage, (both tests' means had small standard errors within 1 and 2). These results strongly suggest that there is an improvement in the performance of the students in the post-test. However, as to whether the mean differences between the pre-test and post-test scores are significantly different or not, the differences in student performance at the pre-intervention (Pre-test) and Post-intervention (Post-test) stages were tested by developing the following hypothesis at a chosen significance level of 0.05 (Cooper & Schindler, 2006).

H0: There are no significant differences between means of the class performance at the Pre and Post stages

H1: There are significant differences between means of the class performance at the Pre and Post stages

Mathematically, the above hypothesis is written as:

H0: $md = 0$

H1: $md \neq 0$

The results in Table 6-5 depict the paired sample t-test analysis for the significance of the mean differences for the overall performance of the class at the pre-test and post-test. The results indicate that the mean difference in class score between the pre-test and the post-test (mean difference = -22.007) is significant at 0.05 ($p = 0.000$, $t = -13.404$, $df = 68$) within 95% confidence (range -25.283 to -18.731). These results imply that, overall the mean of the class score at the post-test is significantly greater than the mean score in the pre-test. It is necessary to test the validity of the mean difference. For the paired samples t-test to be valid, the differences between the paired values should be approximately normally distributed (Cooper & Schindler, 2006).

Table 6-5: Test of significance of the mean differences in overall student performance in pre-test and post-test

Paired Samples Test									
		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Class score at Pre-test – Class score at Post-test	-22.007	13.638	1.642	-25.283	-18.731	-13.404	68	.000*

*significant at 0.05, two tail test

The validity test could be assessed by doing a simple Kolmogorov-Smirnov test (Cooper & Schindler, 2006) that requires a non-significant result (i.e. p > 0.05 – see Table 6-6). The results of the validity test show that p = 0.298 (0.337 - 0.041), indicating that the mean difference is normally distributed. Moreover, it is necessary to estimate the effect size of the significant mean difference. This could be done by using the Eta Squared, which is calculated as:

$t^2/_{t^2 + N - 1}$ Where $t^2 =$ t-value; N = number of cases.

Using our data, the effect size is $= {-13.404^2}/_{-13.404^2 + 69 - 1}$

= 0.725

To interpret the 'eta squared' values the following guidelines can be used (Cohen, 1988): .01=small effect, .06=moderate effect, .14=large effect. Given an 'eta squared' value of .725, we can conclude that there was a large effect, implying that there are about 72.5% substantial differences in the improvement of students' performance in CS after the intervention. In summary, it could, therefore, be concluded that overall the intervention that was given to the students significantly helped them to improve upon their performance in the written communication test.

Table 6-6: Test of Validity of Mean Differences between Pre-test and Post-test scores

One-Sample Kolmogorov-Smirnov Test			
		Overall class score Pre-test	Overall class score Post-test
Kolmogorov-Smirnov Z		1.393	.943
Asymp. Sig. (2-tailed)		.041	.337
a. Test distribution is Normal.			

N = 69

6.3.3 Analysis of differences in student performance at the pre-intervention and post-intervention stages for four different aspects of Communication Skills

The descriptive statistics for the students' performance at the two stages for the four aspects of the written communication test in CS (*Content, Organisation, Expression* and *Mechanical Accuracy*) are presented in Table 6-7 below.

Table 6-7: Descriptive statistics for students' performance in pre-test and post-test

Pairs	Aspects of Comm. Skills	Mean	Std. Deviation	Std. Error Mean
Pair 1	Score for Content at Pre-test	13.7	4.43	0.53
	Score for Content at Post-test	21.20	3.37	0.41
Pair 2	Score for Organisation at Pre-test	10.70	2.07	0.25
	Score for Organisation at Post-test	13.60	2.96	0.36
Pair 3	Score for Expression at the Pre-test	13.7	4.43	0.53
	Score for Expression at the Post-test	27.75	5.99	0.72
Pair 4	Score for Mechanical Accuracy at Pre-test	0.02	0.18	0.02
	Score for Mechanical Accuracy at Post-test	2.00	2.42	0.29

N = 69

The results in Table 6-7 above indicates that the means for the students' scores in the post-test are greater than the means of the pre-test in the aspects of *Content, Organisation, Expression* and *Mechanical Accuracy*. These results strongly suggest that there seems to be an improvement in the performance of the students in the post-test. However, as to whether the mean differences between the pre-test and post-test performances are significantly different from zero, the results in Table 6-8 depict the significance of the mean differences for each of the aspects of the written communication test in CS.

The results in Table 6-8 depict the paired sample t-test analysis for the significance of the mean differences for each aspect of the written communication at the pre-test and post-test. The results indicate that the mean differences in class score between the pre-test and the post-test for each aspect of the subject are significant at 0.05 ($p < 0.05$, $df = 68$, $t =$ -6.83 to 16.4) within 95% confidence.

Table 6-8: Test of significance of the mean differences in students' pre-test and post-test scores

Paired Differences									
					95% Confidence Interval of the Difference				
	Tests	**Mean**	**SD**	**SE Mean**	**Lower**	**Upper**	**t**	**df**	**Sig. (2-tailed)**
Pair 1	Score for *Content* at Pre- and Post-test	-7.5	5.28	0.63	-8.77	-6.23	11.80	68	0.000*
Pair 2	Score for *Organisation* at Pre- and Post-test	-2	3.46	0.42	-3.73	-2.07	-6.96	68	0.000*
Pair 3	Score for *Expression* at Pre- and Post-test	-1.41	7.09	0.85	-15.76	-12.34	-16.4	68	0.000*
Pair 4	Score for *Mechanical Accuracy* at Pre- and Post-test	-1.99	2.41	0.29	-2.57	-1.41	-6.83	68	0.000*

*p-value significant at 0.05

The paired samples test validity, using Kolmogorov-Smirnov test (see Table 6-8), shows that all p-values of the aspects of the subject are significant at 0.05 ($p > 0.05$), except the p-value for *Mechanical Accuracy* ($p = 0.000$), indicating that the mean differences are normally distributed across the aspects of the subject, except for *Mechanical Accuracy*.

Table 6-9: Test of Validity of mean difference in students' pre-test and post-test scores

	Content	Organisation	Expression	Mechanical Accuracy
Kolmogorov-Smirnov Z	.851	.934	.775	2.386
Asymp. Sig. (2-tailed)	.463	.347	.585	.000
a. Test distribution is Normal.				

N=69*: One-Sample Kolmogorov-Smirnov Test*

Moreover, the effect size of mean differences was estimated using 'Eta Squared' formulae for each aspect of the written communication test (see Table 6-9). Following the guidelines from Cohen (1988): .01 = small effect, .06 = moderate effect, .14 = large effect, the results showed that there were large effects in improvement in student performance for all the aspects of written communication test at the post-test stage as compared to the pre-test stage, with the largest effect realised in *Expression* (0.798 or 79.8% improvement), followed by *Content* (0.672 or 67.2% improvement), then *Organisation* (0.416 or 41.6% improvement) and finally *Mechanical Accuracy* (0.407 or 40.7% improvement). In summary, it could be concluded that the intervention or treatment given to the class of students significantly helped them to improve upon their performance in all aspects of the written communication test.

Table 6-10: Test of Effect Size of mean difference in students' pre-test and post-test scores

	Content	Organisation	Expression	Mechanical Accuracy
Eta Squared (Effect Size)	0.672	0.416	0.798	0.407
Explanation of Effect	Large effect	Large effect	Large effect	Large effect

N = 69

6.4 Analysis of Findings

The results from the above analysis (tables 6-4 to 6-10) after the formative experiment indicate that the intervention given to the students significantly helped them to improve upon their overall class performance in CS. Specifically, there was about 72.5% substantial improvement in the overall performance of the students in Communication Skill after the intervention. The results also indicate that the intervention given to the students significantly helped them to improve upon their performance **within each aspect** of the written communication test of CS. Specifically, the results showed that there was 79.8% improvement in *Expression*, followed by 67.2% improvement in *Content* aspect, then 41.6% improvement in *Organisation*, and finally 40.7% improvement in *Mechanical Accuracy* after the intervention was applied.

However, as with any one group pre-test/post-test research design a number of limitations may impact on this study and thus caution is necessary when analysing the findings. This is with reference to perceived problems in drawing general inferences about whether the intervention that was given to the students resulted in the improvements of the performance of the students as shown in the data presented. These problems are what have been referred to in experimental designs as threats to internal validity (Bryman, 2008; Blaike, 2010 & Creswell, 2012). The threats to internal validity in this research refer to the possible questions that might be raised as to whether indeed it was the use of ABLECAT that actually resulted in the improvements of the performance of the students in the Communication Skills course. Among the possible threats to the validity of the findings to be acknowledged here are the following:

(i) *History* – There is the possibility that in the course of two academic semesters when the intervention took place, some events might have occurred between the beginning of the intervention through to the end, which might have contributed to the improvements of the performance of the students in the written communication test (Blaike, 2010 & Creswell, 2012). For example, the students went through five (5) other courses per semester apart

from the CS course. It is possible that instructions and activities from other lecturers in those courses might have helped them to perform better in the post-test.

(ii) *Maturation* – maturation might refer to changes in the students due to normal developmental processes in human beings as a function of time (Creswell, 2012). For example, within one academic year when the intervention took place, the students might have gained some experiences of University life which could have influenced the maturity in their writing as demonstrated in the post-intervention exit test, as opposed to when they first enrolled on the programme (Blaike, 2010 & Creswell, 2012). Consequently, it could be suggested that their maturation on the programme could have accounted for their high performance in the written communication test that was administered.

(iii) *Selection* – Creswell (2012) identified people factors that could influence the post intervention outcome, such as the selection process which might have been biased towards individuals, who are brighter, a group which is more receptive to, or more familiar with the intervention. The students who were chosen for the intervention were from a group who were undertaking a programme in Information Technology Education. Their background information indicates that the majority of them possessed ICT skills. Therefore, it could be suggested that they were more receptive to the online learning environment or were familiar with online learning. This might probably have accounted for their motivation to utilise the intervention and hence their high performance in the written communication test.

The above-perceived threats to internal validity of the intervention, notwithstanding, the literature on research designs explains and justifies the use of such a pre-test/post-test design for the intervention. Such research design is often used for evaluating programmes with the objective of determining the effectiveness of a particular program (Spector 1981) especially where control or comparison groups are unavailable. This explanation holds true for this research. This research took place at the public-funded university. The students were on a *strict* schedule of an academic calendar where *random assignment* could not be undertaken (a characteristic of a true experiment in research) of the students to enable a *true* experimental design.

To counter such perceived threats to internal validity, as well as meet the criteria for generalising the design knowledge, Reigeluth & Frick (1999) posits that the use of formative and design experiment should rather be concerned with preferability, the extent to which the method best suits the study in order to attain the desired outcome. The criteria to use to explain what constitutes a better preferability should depend on the values of all those who have a stake in the

application of the design theory. The proposed values are *effectiveness*, *efficiency* and *appeal* (Reigeluth & Frick, 1999).

The value of *"effectiveness"* can be said to be achieved in this formative experiment. First, based on a design proposition, a *sequence of learning design was* developed. The *sequence of learning design* (see *section 4.5*) included the resources, tasks and supports that aimed at achieving the intended pedagogical goal. A learning activity model was enacted (ABLECAT) in a classroom which was evaluated using an interview and a survey of the students.

The qualitative data pointed to a suggestion that the design and implementation of ABLECAT impacted positively on the students in the teaching and learning processes of the CS course. The quantitative data also pointed to a suggestion that the students perceived the design and implementation of ABLECAT as a platform that offered them an avenue to improve on their knowledge and skills in the CS course. These two data were confirmed by the post-test analysis which suggested substantial improvement in the overall performance of the students in Communication Skill after the intervention.

Therefore, these data suggest that the value of *effectiveness* was achieved with the intervention, because the students who have a stake in the intervention have expressed positive perception about its suitability for the development of their skills and knowledge in the CS course (Reigeluth & Frick, 1999).

To provide *efficiency* as a value for the intervention, a considerable amount of human time, effort and energy was expended on the entire intervention. First of all, the team of the instructional designer, the CS course lecturer, the web designer and the researcher spent a considerable amount of time, effort and energy to come up with the first design of ABLECAT. A lot of time and energy were expended to monitor its implementation for five weeks. Thereafter, a lot of time was expended in the redesign of ABLECAT, re-enacted it and monitored its implementation for the second semester of the academic year.

The resources that were needed for the intervention were to a large extent provided. These resources included a three-year subscription of a domain name for the research (www.uew-ksi.info). This subscription gave the students a dedicated and uninterrupted hosting site for the intervention. Further resources on the CS course website (ABLECAT) included online readings, annotated URLs on CS, video-taped summary of the lecturer's comments and explanations, coursework and self-assessment quizzes. The provision of these resources gave the students 24/7 access to the CS course materials anywhere and anytime for their learning. Apart from the tasks that were given to

the students at various stages of the *learning activity sequence*, there was a provision of support in the form of e-mail and discussions forum and a collaborative small group activity. Therefore, the considerable amount of time, energy and effort expended on the design and implementation of ABLECAT in two cycles, and the materials, tasks, and support provided for the students contributed to the relative *efficiency* of the intervention and subsequently, the suggested improvement in the skills and knowledge of the students in the CS course.

The *appeal* of the intervention could be looked at by the tendency of the students to want to continue to learn by using the intervention (Reigeluth, 1983). In this intervention, the *appeal* could be looked at how the students used ABLECAT to make relevant comments and how successful or otherwise were the students able to use ABLECAT to perform the assigned tasks (Frick & Reigeluth, 1992). To be able to find out how the intervention appealed to the students, both classroom observation and informal conversational interviews were used. The observation and interviews pointed to a suggestion that, the design and implementation of ABLECAT impacted positively on the students in the teaching and learning processes of the CS course.

In sum, even though the perceived threat to internal validity does not make the intervention highly generalizable to other similar situations, the design theory that underpins the intervention suggested that ABLECAT was effective, efficient and appealing to the improvement of the students' knowledge and skills in CS.

6.5 Unintended consequences of the intervention

In order to identify and seek explanations for unanticipated effects and outcomes in this research, Reinking & Bradley (2008) stated that in conducting formative and design experiments, steps should be taken to ensure that data collection, analysis, and interpretation allow for the identification of such effects and outcomes. The reason for this requirement is that it could bring about modifications to existing theory or the development of new theory and bring about further research that might be aimed at accomplishing other goals or testing other theories (Reinking & Bradley, 2008). In this study, the researcher assuming the role of an "online lecturer" could be pointed out as one of the unintended consequences of the intervention.

6.5.1 The question of "e-moderating"

To provide a smooth implementation of the intervention (ABLECAT) the researcher had to perform the role of the "online lecturer" in the CS course. Salmon (2004) refers to this online

teaching and facilitating roles as "electronic moderating" – e-moderating. In e-moderating, Salmon (2004) has identified the concepts of time, motivation and the quality of support and training as the key factors in the success of e-learning whether in a blended, online only or technology enhanced mode. A good knowledge and skills of e-moderating are highly required in order to meet these factors to improve learning and to support the construction of knowledge by the students especially on ABLECAT.

To be able to provide and maintain enthusiasm for the participants in the online phase of the use of ABLECAT, the researcher had to ensure that enough ***time*** is devoted each week to assist the course lecturer to create learning materials and tasks for the various topics on the CS course and for the students' smooth participation of activities on ABLECAT.

At the pre-f2f session of the intervention design, the researcher had to upload learning materials and task on the topic for the week on ABLECAT and send an e-mail notification to all the participants as part of the experiment. At the mini-lectures, the researcher had to assist the lecturer with the digital projection of the students' forum posts for discussions and comments in class. Thereafter, there was video-recording session of the lecturer's comments and explanations on the topic at his office, and editing of the video before uploading it together with the coursework/quiz online on ABLECAT. Furthermore, the researcher needed to send e-mail notification on the posting of video-recorded comments and the coursework to the students as well as set aside some time to attend to the groups' forum posts and provide feedback on the coursework of the students all as part of the study.

The intervention also facilitated the acquisition of the relevant technical skills that were needed to provide support for the students to operate successfully with the learning environment. Among the skills acquired included operational understanding of the software in use; the ability to appreciate the web and Internet's potential for learning; knowledge on how to use special features of software for e-moderators; ability to use special features of software to explore learner's use, for example, message history, summarizing, etc. and ability to introduce online resources without diverting participants from interaction.

6.5.2 Changes in the educational environment

Formative and design experiments is transformative in that the intervention that is the object of a formative or design experiment could potentially transform the teaching and learning environment positively beyond the narrow pedagogical goals (Reinking & Bradley, 2008). One of

the changes that could be pointed to from the intervention resulted from the support provided the students in the use of ABLECAT in e-moderation during the intervention. This support culminated in the institution of small group activity among the students for collaborative learning. This support was provided with an asynchronous collaboration tool that involved text-based communication and the sharing of documents or multimedia files as well as links to further reading. The choice of a text-based communication tool for the CS was based on the choice of written communication as a form for developing the students' CS skills. Since it has been designed for asynchronous discussion for groups of varying sizes, it was realised that the most common tool for supporting the students on ABLECAT for asynchronous discussion in groups was the ***forum*** (Macdonald, 2008). For an effective use of the forum, the students were divided into small groups of four each (see figure 6-1).

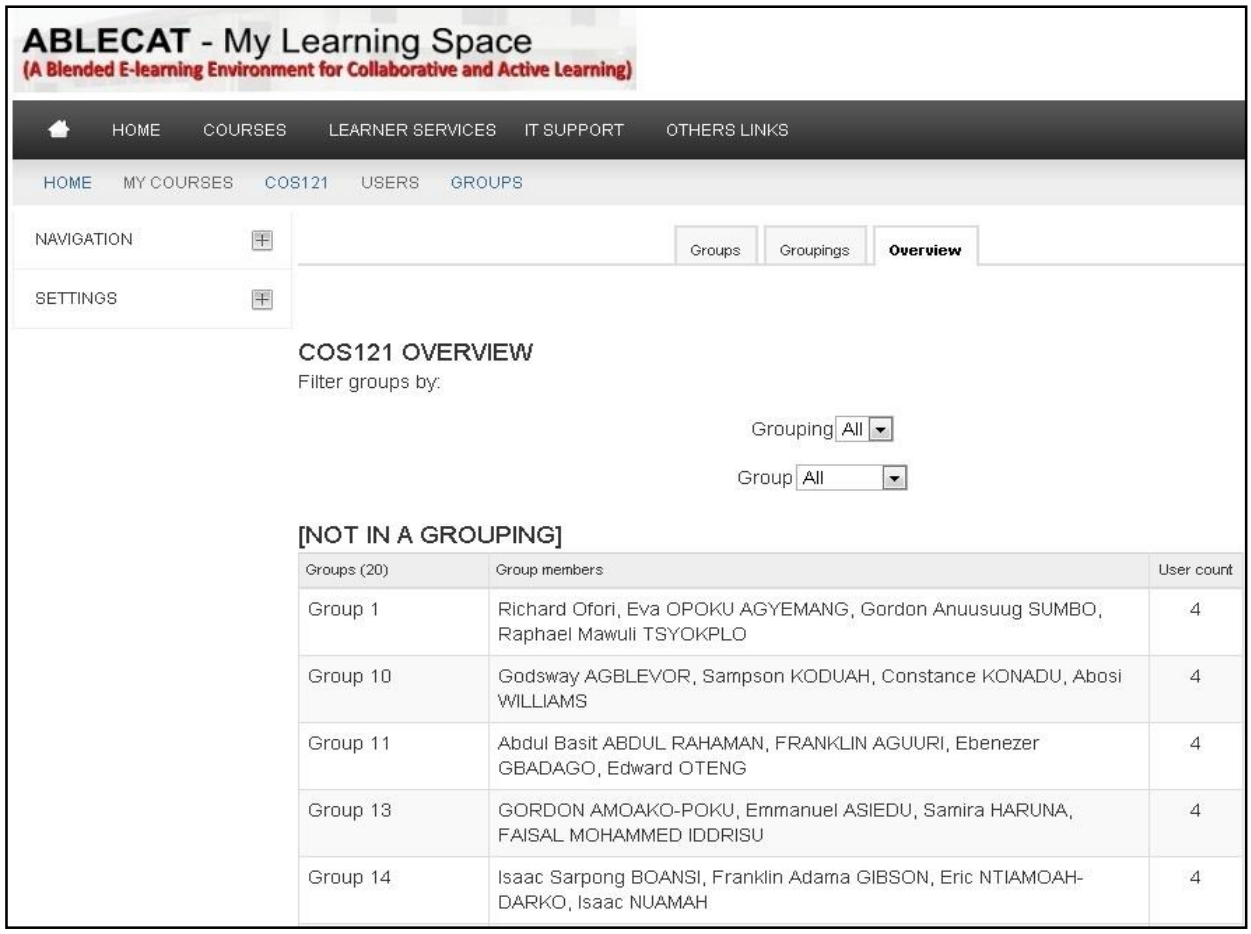

Figure 6-1: Groupings on ABLECAT

Each group maintained a constant membership for easy identification by both members and the moderator as well as for easy monitoring of the progress of each group by the lecturer (Macdonald, 2008). The main purpose of the formation of small groups was to encourage

collaborative writing. By meeting at these groups, whether face-to-face or online, and presenting and sharing ideas, the students were supposed to take turns to write their ideas by way of forum posts. This is because learning through collaboration is "done through participation and negotiation with peers" (Laurillard, 2012:187). However, the formation of this small group for collaborative writing became a regular feature for the students. They realised they could maintain these groups to study for other courses. They could often be seen at the SRC pavilions in these small groups sharing ideas on various courses (see figure 6-2).

Figure 6-2: Small group meetings of the students

It could therefore be suggested that this support given to the students also contributed significantly to the institution of small group activity among the students. This has in a way contributed to how the students collaborate, share and learn from each other in their various courses. This is what (Laurillard, 2012) refers to as "peer modelling". It means that each student can learn from how the others' work, what they say and how they address the topics in CS. The small group feature of the design of ABLECAT could then be referred to as one of the changes that occurred in the educational environment due to the intervention.

Additionally, the use of electronic projectors in the CS classroom became one of the changes that occurred in the educational environment due to the intervention. Hitherto, the only teaching and learning tools of the lecturer were the chalkboard and markers. With the introduction of the intervention the lecturer realised the importance of the use of electronic projectors to present his teaching and learning of the course. Furthermore, the CS course was moved to the computer laboratory to take advantage of the provision of ICT resources to facilitate teaching and learning.

With the introduction of electronic projectors for lecture presentation, the students saw the need to make use of their smart phones to record/capture the PowerPoint presentations of the lecturer (see figure 6-3)

Figure 6-3: Students recording/taking shots of the lecturer's PowerPoint presentation on their smart phones

This gave the students the opportunity to have the presentation of the mini-lecture on their smart phones. Apart from the obvious advantage of enabling them to access learning wherever and whenever they wanted, this process also helped the students who were off-campus to save cost of accessing the Internet service in order to download or read the mini-lectures online.

6.6 Summary

This chapter has been used to explain how the design propositions were supported by the data gathered during the intervention. The students' perceptions were that ABLECAT offered them an avenue to improve on their knowledge and skills in the CS course. Even though some perceived threat of internal validity to the intervention has been acknowledged, the design theory that underpins the study suggested that ABLECAT was effective, efficient and appealing to the improvement of the knowledge and skills of the students in the CS course. The role of the

researcher as an e-moderator was one of the unintended consequences of the intervention identified. Additionally, among the profound changes in the educational environment that could be assigned to the intervention were the institution of small group activity feature of the students who took part in the intervention and the use of electronic projector in the presentation of teaching and learning of the CS course by the lecturer. The next chapter presents the main findings of the research study, the implications that could be drawn, the limitations and the conclusions of the study.

Chapter 7

7 Findings, implications, conclusion and limitations of the research study

7.1 Introduction

In this study, design *propositions* were made leading to the design of a *learning design sequence* and a model for the *enactment of the learning activity*. A prototype learning environment was implemented in a classroom setting, modifications were made to the prototype and the redesigned learning environment was evaluated for the improvement of the knowledge and skills of the students in the CS course. The results of this study are significant for a number of reasons.

7.2 Findings and implications for the design propositions

Against the backdrop of the potential problem with comparisons of the learning effectiveness of online learning and traditional (face-to-face) teaching that has evolved the notion of "no significance difference" in learning outcomes (Swan, 2003), and the controversy that surrounds the traditional classroom vs. Computer-assisted language learning comparisons (Chapelle, 2003), I draw further suggested findings in this study from the students' perceptions in terms of the quality of the content, learning, communication and the level of engagement they experienced from the use of ABLECAT. These suggested findings were derived from the three design propositions that underpinned the *learning design sequence*.

First the results from the classroom observation, informal conversational interviews of the students and the survey of the students support the findings of previous research (Chapelle, 1998; Kupetz & Ziegenmeyer, 2005 & Harker & Koutsantoni, 2005) that when learners are provided with multiple formats of learning materials in blended learning it could sustain the students' interest and thereby promote their cognitive engagement in CS. From the activity logs on ABLECAT, it was discovered that most of the students logged in to view the course materials (lecture notes, lecturer's video explanations and comments, links to websites on CS) every week. The activity logs on course materials were higher when the students were asked to undertake course work or assignment on the topic for the week. This indicates that the students utilised the course materials for their coursework and assignments. This could be attributed to the fact that the course materials were accessible all the time (24/7) and at any place (at home as well as on campus) provided the students have access to the Internet (Boyle, Bradley, Chalk, Jones, & Pickard, 2003).

This finding notwithstanding, the use of web-based materials for blended learning programmes can be problematic in terms of Internet access and access to the website (Harker & Koutsantoni, 2005). Some of the students encountered some problems with Internet access and connectivity (low bandwidth) on the university campus, as outlined among the inhibiting factors of the study. The problem of Internet access and network connectivity was among the general comments that were expressed by the students in the open-ended question of the students' evaluation report of the study which sought to find out the overall thoughts of the students about the use of ABLECAT. This implies that any adoption of the design proposition as outlined in this section should take note of the challenges that Internet connectivity poses to the institution of blended learning environment initiatives.

Secondly, the results from the classroom observation, informal conversational interviews of the students and the survey of the students support the findings of previous research (Aycock, Garnham, & Kaleta, 2002; Chen, Belkada, & Okamoto, 2004 & González-Lloret, 2003) that when learners are provided with adequate and appropriate communication tools in blended learning environments it could enhance interaction and collaboration with peers and instructors and thereby enhance their development of knowledge and skills in the course. In the study, both the e-mail and forum were used as the communication tools on the course website. Findings from both the qualitative and quantitative data suggested that these tools enhanced communication among the students as well as between the students and the lecturer. However, a closer look at the activity logs of the students on ABLECAT, show that only a few 'ardent' students regularly posted misconceptions on the forums that were created for the topics. Much of the interaction that took place was by the use of the e-mail. The essence of the use of the forums was to create an avenue for the students to regularly exhibit their knowledge and skills in the CS course by writing. The forums were also meant to serve as avenues where the lecturer would be able to assess the accuracy of the content, the originality and development of thoughts and ideas that are exhibited by the students. This, in a way enabled the lecturer to find out common mistakes in the use of the language for subsequent remedial measures.

Additionally, the written communication test for both the pre-test and post-test aimed at finding out how the students produce accurate content, originality and development of thought and ideas. Even though, the design of the use of forums on ABLECAT was closely related in time and on the topic for the mini-lecture sessions, the students' minor contributions made it difficult to conclude that the use of forums resulted in the development of their knowledge and skills in the CS

course. It is therefore, suggested that future related research study employs the use of awarding credit for students' participation in online forums to promote its use and to really assess its impact.

Thirdly, the design of ABLECAT incorporated task and activities, coursework and assignments that provided immediate feedback to the students. This proposition was meant to foster collaboration among the students, engage the students' attention in the course and thereby, help build their understanding and use of the concepts in the CS course. In this study, the design of task on ABLECAT was meant to facilitate the involvement of the students in comprehending, manipulating, producing or interacting in the course. The re-designed CS course outline incorporated collaborative-active task. The purpose of these tasks was, to provide an avenue that would prepare and motivate the students' interest in the course, describe clearly what is expected from the students in terms of the task and explain the steps the students should go through to achieve the objectives of the topic - activities.

Furthermore, the re-designed course outline provided a list of resources – both online and offline that the students could use to achieve the objectives, as well as an avenue for checking immediate feedback on the assignments and coursework. It is therefore, suggested that the provisions enumerated above enabled the construction of innovative learning and assessment tasks that provided opportunities for the students to engage with the CS course. Consequently, results from the classroom observation, informal conversational interviews with the students and the survey of the students indicate that when learners are provided with tasks and activities in a blended learning environment it promotes cognitive engagement of the learners. It can therefore, be suggested that this eventually led to the development of knowledge and skills of the students in the CS course.

Although the findings from this study show the transformative potential of the intervention, there could be an issue with the generalization of the findings to all courses in the University setting. It is therefore pertinent for future research endeavours to study the effects of making use of the intervention across various courses in different situations.

7.3 Contributions of the Research

This study was carried out to analyse the utilization of a blended learning environment for the teaching and learning of communication skills. The study has made significant contributions both theoretically and methodologically in the area of utilizing blended learning in the tertiary educational sector. Among the contribution made are the generation of local design theory and a

new approach to using formative experiment in the study of pedagogical relevance of blended learning environment especially in tertiary education.

7.3.1 Generation of local design theory

First and most significantly, the results of this research explicate the purpose of formative and design experiments (the research strategy which underpins this study) which is to develop theories about both the process of learning and means designed to support that learning (Gravemeijer & Cobb, 2006; Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003 & Reinking & Bradley, 2008).

Through this study, a local theory was developed about both the process of learning and the means designed to support the learning of CS through a designed *learning design sequence*. The key principle of using the *learning design sequence* was to design a representation of the learning activities and the support activities that were performed by different actors on ABLECAT (students, lecturer) in the context of the CS course. Having identified the insufficiency of the provision of 'only content for read and test activities' for effective online learning, and the advantages of learning as an active process of knowledge construction, the use of *learning design sequence* provided for the inclusion of task (learning activities) to assist the students who might be incapable of effective and efficient learning on their own.

The findings in this study showed that the provision served as a technique that engaged the students and motivated them above merely presenting them with learning materials. Secondly, the *learning design sequence* followed a concept that gave thought to the sequential order and timing of the various activities and the presentation of the resources needed to support them. This gave 'birth' to the use of '*motivate, explore, apply* and *review/assess'* design of ABLECAT. In the research context, the instructional strategy and method are mainly expository and presentation/ lecture respectively. The strategy and method have been found to pose challenges in the development of CS (Boateng & Ofori-Sarpong, 2002; Tagoe, 2009). Among the challenges is lack of interaction with the lecturer. Therefore, the first design element, '***motivate'*** was meant to facilitate the provision of tasks and activities to initiate new discussion on students' reading and writing activity (see 5.3.1). The students were then offered the provision to communicate their misconceptions (if any) to the lecturer through the use of online forums that were set up on ABLECAT for each topic. Research shows that when students are motivated to interact with the lecturer in the teaching and learning situation it

affects the rate of their academic achievement and attendance in blended learning environments ((López-Pérez, Pérez–López, & Rodríguez-Ariza, 2011; Vaughan & Garrison, 2005).

The second design element was termed as '***explore'***. Here, the set up included a mini lecture and a small group activity in class that was meant to facilitate the exploration and exchange of ideas between the lecturer and the students as well as among the students themselves (see 5.3.1). In the research context, the instructional method was mainly presentation/lecture where the students listen and take notes from the lecturer. The result from this instructional method was that the students were unable to have an avenue to share their ideas and be aware of the different perspectives of the topics from their colleagues and the lecturer. In addition to providing the students an avenue to share ideas from the mini lecture and the small group meetings, the design element offered the students the opportunity to get to know each other better, leading to the creation of a stronger sense of academic community and collaborative spirit that are necessary for improved learning outcomes (Vaughan & Garrison, 2005; Akyol & Garrison, 2011).

The third design element was termed as '***apply'***. This element provided for activities such as re-use of the lecturer's comments and the review of the video-taped session for reinforcement by the students. Online self-assessment quizzes on ABLECAT to create an opportunity for the students to exhibit their knowledge and skills in each of the topics discussed weekly were part of the design element (see 5.3.1). It has been reported in the research context that due to the large class sizes hardly do the lecturers conduct continuous assessment, a situation which results in students graduating with little practice for critical analysis and writing. Research shows that online quizzes and tutorials save time for tutors and since they are marked and results captured electronically, lecturers had access to student performance and students find the immediate feedback useful, in that, misconceptions could be dealt with immediately (Jaffer, Ng'ambi, & Czerniewicz, 2007).

The final design element was termed as ***'review/assess'***. This element enabled the students to compare their work and to learn from each other on ABLECAT. Additionally, the students were offered the opportunity on ABLECAT to express their thoughts on the each weekly topic (see **5.3.1**). This strategy was meant to improve the students' knowledge construction and also to set the tone of initiation of dialogue on the next topic. The expository instructional strategy is mostly employed in the research context only to test for reception, recall and understanding through repetition or rephrasing of the message by the lecturer. This instructional strategy provides limited opportunities for learners to practice and apply the newly acquired knowledge to real life situations. The design element (review/assess) therefore, promoted peer role modelling which had the potential

to instil confidence in the students and thereby promoted better learning outcomes (Vaughan & Garrison, 2005).

The findings in this study showed that the students were able to use the resources on ABLECAT from the pre-face-to-face session through the tasks/activities that were set, to the application and assessment stages by the support that were given to them.

The implication here is that the design of such a workflow could be used to translate pedagogical theory into a template that can be applied to multiple contexts by other academics interested in developing the knowledge and skills of their students in a course. In sum, the *learning design sequence* and the design propositions facilitated the development of a blended learning environment (ABLECAT) for the effective teaching and learning of CS.

It also implies that the *learning design sequence* and the design propositions could become a useful record of learning design for sharing and reuse in the future by the academic community. Especially in the academic and geographical context in which ABLECAT was used, the *learning design sequence* and the design propositions could serve as a blueprint model for lecturers who would like to improve on the knowledge and skills of their students in the CS course.

7.3.2 Formative Experiment in Teaching and Learning Research in Tertiary Education

Formative experiment has been widely used in basic literacy research. However, its use in tertiary educational setting and in ICT mediated teaching and learning research has been rare especially in developing countries such as Ghana. This study thus, provides rich literature as well as methodological contribution for both educational and other institutions for research into the adoption and diffusion of ICT-enabled platforms. The suitability of formative experiment beyond basic literacy research is therefore, confirmed by the study.

7.4 Limitations of the study

The results of this study should be interpreted in the light of its limitations, even though, it adds to the literature of design of blended learning environments for the effective development of knowledge and skills in CS, and formative and design experiments. Among these limitations is the fact that this formative experiment was conducted in one course out of the lot in the University. This limitation makes the generalizability of the findings of the study to other courses in much different contexts and with students with much different characteristics a bit contentious.

Secondly, this formative experiment is devoid of a control group of students of which to make a direct comparison for a similar context. The weaknesses in making comparisons using the pre-test and the post-test to draw conclusion is also acknowledged and compensated for with the effectiveness, efficiency and appeal of formative experiment through the use of a local design theory that underpins the intervention.

The student-participants for the study were not randomly selected and therefore, could not be a representative of the entire student body of the university. However, the choice of the sample was based on their availability and accessibility throughout the duration of the experiment. Furthermore, the time frame of the research study did not permit finding out the stability of the students' progress. The students' progress could also have been measured against the previous batch of students to find out the difference ABLECAT was able to make. This was not possible because the final semester examinations had not been conducted when the research study ended.

Finally, much data was not collected from the lecturer's point of view in terms of the effect ABLECAT had on the teaching and learning of the CS course. This would have helped cross-validate the perception of the students in terms of their learning with ABLECAT.

7.5 Conclusions

The massification of student numbers in most higher education institutions in Africa has not been adequately matched with infrastructure development and human capacity building negatively impacting on the quality of teaching and learning. Due to the large class sizes in most tertiary institutions, Communication skills, one of major skills that employers in Ghana look out for in the tertiary graduate has been affected due to the way the course is taught in tertiary institutions. With the advent of a plethora of ICT tools in Ghana, there have been calls for the use of ICT to help improve the teaching and learning of communication skills. However, many educational researchers have highlighted the limitation of using ICT tools alone in the teaching and learning of soft-skills based course such as communication skills

The study thus, examines how the use of blended learning environment could facilitate the effectiveness of the teaching and learning of communication skills from the perspectives of both students and lecturers. This study was carried out in one of the public universities in Ghana. At the time this study began, the total number of the student population of the university stood at 50,012 students, made up of 17, 630 full time students, 23,746 distance learning students and 8,636 students

on sandwich/part-time study. The university had a teaching staff of 381, which comes up with a lecturer student ratio of 1:46 against the institutional requirement of 1:27.

Even though, the university boast of some ICT infrastructural development, including wireless broadband access on its campus, the classrooms are devoid of these ICT tools. Lectures are conducted in large classrooms without electronic public address systems and projectors. The main instructional strategy is expository teaching and presentation/ lecture method of instruction. The University of Education, Winneba where this research was conducted therefore, epitomises an example of a situation where the development of communication skills of the tertiary graduate could be hampered by the institutional challenges.

The study adopted formative experiment, a variant of educational design research or design-based research as a methodological approach. This was meant to provide guidance about what factors might be relevant to a successful implementation of an intervention iteratively in the particular context and ultimately generate usable knowledge for similar adaptation. The research process comprises four phases that span a period of two academic semesters. Both quantitative and qualitative data were collected in a concurrent embedded mixed method approach. Qualitative data was collected throughout the study and quantitative data was collected prior and after the intervention. The analyses of the various data collected together with the design propositions enumerated in the literature, a proposed learning design sequence upon which the blended learning environment 'ABLECAT' was developed. The elements in the learning design sequence are *Motivate*, *Explore*, *Apply* and *Review/Assess* which outline the resources, tasks and supports as well as an avenue for interactions and collaboration in a blended learning environment.

The qualitative data that was gathered during the intervention pointed to a suggestion that the design and implementation of ABLECAT impacted positively on the students in the teaching and learning processes of the CS course. The quantitative data also pointed to a suggestion that the students perceived the design and implementation of ABLECAT as a platform that offered them an avenue to improve on their knowledge and skills in the CS course. These two data were confirmed by the post-test analysis which suggested substantial improvement in the overall performance of the students in Communication Skill after the intervention.

One of the key contributions of this research is the generation of local design theory. This was based on a learning design sequence, a concept that gave thought to the sequential order and timing of the various activities and the presentation of the resources needed to support them. This gave 'birth' to the use of '*motivate, explore, apply* and *review/assess'* design of ABLECAT. Following

from the thick description of the research context, the elements of the learning design were duly explicated in the literature. This could serve as a template that can be applied to multiple contexts by other academics interested in developing the knowledge and skills of their students in a course.

7.5.1 Reflections on the Methodological Approach

Formative experiment used in this research combines both qualitative and quantitative analysis. While experimental studies are widely known to be quantitative, the use of formative experiment was found to be suitable for the study since the setting of the research required both quantitative and qualitative data and analysis in order to make valid conclusions.

In developing countries such as Ghana, the difficulty in obtaining official data as well as difficulty in data collection for researches such as this could not be underestimated. Hence the choice of an appropriate research methodology that would enable substantial ease in the collection of data from the study subjects in order to draw valid conclusions was essential for this study. The feedback platform, observation and the level of interaction provided under formative experiment were found to be effective tool in the study of the effectiveness of blended learning environment for the teaching and learning of Communication Skills in a large class size.

The successful use of formative research for technological research in a tertiary education level is also another significant methodological success for this study. Formative experiment which has widely been used in basic literacy research thus provided an effective methods and tools to test the blended learning environment among adult learners in a university setting.

The challenge of mixing with study subject and their influence on the findings especially using the qualitative data and analysis were compensated for by the quantitative data and analysis which were collected devoid of the personal interactions with the study subjects. The qualitative tool in the formative experiment was also used to provide clear understanding and explanations of the findings from the quantitative data and analysis.

7.5.2 Blended learning Environment and the achievement of pedagogical objectives

The study also highlights the achievements of the students who were the subject of the formative experiment. There have been calls of virtual e-learning as solutions to the increasing numbers of students admitted into the Ghanaian universities (Anamuah-Mensah, 2014). These calls often assumes technological determinism by prescribing ICT as the sole remedy to effective teaching

and learning in universities given the large class sizes. However the immediacy and leadership provided by lecturers in lecture theatres facilitate the achievement of certain learning objectives.

Hence this study postulated that the blended learning environment provides a more effective means of achieving the pedagogical goals of teaching and learning of soft skills courses such as Communication Skills in large classes' sizes. The results presented so far attest to the fact that the blended learning environment facilitated the achievements of the pedagogical goals of the subject used in the formative experiment, namely communication skills. There was significant improvement of the students' performance in all the four areas tested under the communication skills course(content, expression, organization and mechanical accuracy) compared with their performance prior to the blended learning environment intervention. These improvements could validly be attributed to the implementation of the blended learning intervention. Hence, the dean of the faculty where this formative experiment took place has recommended the use the blended learning environment as an approach to improve the teaching and learning of the CS course with large class sizes such as the one used for the experiment. .

Another significant achievement under this research is the ability of the students to use their own existing equipment for learning. The experiment provided the students the opportunity to use their laptops, tablets and smart phones to access learning materials which hitherto were not available. This ubiquity of learning provided by the blended learning environment coupled with the immediacy and leadership provided by the lecturer in the classroom ensured that students obtained the best of both technology-enabled as well the tradition face-to-face teaching and learning environments to facilitate the achievements of the pedagogical goals of the course.

7.5.3 Suggestions of the Direction for Future Research

The formative experiment used to draw conclusion for this study took place in one out of the about 8 public universities in Ghana. The study also used only one subject, communication skills course to study the impact of the implementation of a blended learning environment intervention on the students' performance. Again the study used the same students as subject of the experiment where pre-intervention test was done, the intervention was then implemented and post-intervention tested result were analysed to identify the difference in the performance of the students to draw the conclusions. These approaches to the study have been justified and could support the validity of the conclusion drawn.

However this study suggests that with the adoption of the blended learning environment as an innovative tool for the improvement of student performance in the University where this experiment took place, there should be further study into the impact of blended learning environment in other subject areas in the universities to further enhance the validity of the findings from this research.

Wider formative experiments should also be used in the different universities facing similar problem of large class sizes and the outcome compared with this study to further solidify the conclusions drawn from this study.

Experimental research which makes use of controlled and experimental groups from different universities using the blended learning tools could also be explored. This would facilitate the identification of the differences and the significance of the changes in performance of the students after the experimental period to determine how much such differences if any could be attributed to the implementation of blended learning environment for teaching and learning.

These three suggestions for further research into the use of blended learning environment would go a long way to further strengthen and validate the evidence adduced from this study. This study therefore concludes that blended learning environment has the potential to enhance teaching and learning in universities where large class sizes is hindering the achievement of pedagogical goals of the various courses.

References

Abowd, G. D., & Mynatt, E. D. (2000). Charging past, present, and future research in ubiquitous computing. *ACM Transaction on Computer-Human Interaction, 7*(1), 29-58.

Afful, J. B. (2007). Academic literacy and communicative skills in the Ghanaian university: A proposal. *Nebula, 4*(3), 141-159.

Akyol, Z., & Garrison, R. D. (2011). Understanding cognitive presence in an online and blended community of inquiry: Assessing outcomes and processes for deep approaches to learning. *British Journal of Educational Technology, 42*(2), 233-250.

Amir, Z., Ismail, K., & Hussin, S. (2010). Blogs in Language Learning: Maximizing Students' Collaborative Writing. *Procedia Social and Behavioural Sciences, 18*(2011), 537-543.

Anamuah-Mensah, J. (2014). *GhanaWeb*. Retrieved January 16, 2014, from http://www.ghanaweb.com/GhanaHomePage/regional/artikel.php?ID=297220

Anamuah-Mensah, J., Asabere-Ameyaw, A., & Dennis, S. (2007). Bridging the Gap: Linking School and the World of Work in Ghana. *Journal of Career and Technical Education, 23*(1), 133 - 152.

Anderson, T., Rourke, L., Garrison, D. R., & Archer, W. (2001). Assessing teaching presence in a computer conference context. *The Journal of Asynchronous Learning Networks, 5*(2), 1-17.

Andriessen, J. (2006). Collaboration in computer conferencing. In A. M. O'Donnell, C. E. Hmelo Silver, & G. Erkens (Eds.), *Collaborative learning, reasoning and technology* (pp. 277-321). New Jersey: Lawrence Erlbaum Associates.

Angrosino, M. V. (2005). Recontextualizing observation: Ethnography, pedagogy, and the prospects for a progressive political agenda. In N. K. Denzin, & Y. S. Lincoln (Eds.), *The SAGE Handbook of Qualitative Research* (3rd ed., pp. 729-745). Thousand Oaks, CA: SAGE Publications.

Arslan, R. Ş., & Şahin-Kızıl, A. (2010). How can the Use of Blog Software Facilitate the Writing Process of English Language Learners? *Computer Assisted Language Learning, 23*(3), 183-197.

Asabere-Ameyaw, A. (2011). *16th Congregation Address*. Winneba.

AUTC. (2003). *Learning Designs*. Retrieved from Australian Universities Teaching Committee project on ICT-based learning designs: http://learningdesigns.uow.edu.au/project/index.htm

Aycock, A., Garnham, C., & Kaleta, R. (2002). Lessons learned from the hybrid course project. *Teaching with technology today, 8*(6).

Badger, R., & Yan, X. (2008). *To what extent is communicative language teaching a feature of IELTS classes in China?* IELTS Research Report. Retrieved from http://www.ielts.org

Ballard, B., & Clanchy, J. (1988). Literacy in the University: An 'Anthropological' Approach. In G. Taylor, P. Nightingale, J. Clanchy, B. Ballard, & V. Beasley (Eds.), *Literacy by Degrees* (p. 14). Milton Keynes: The Society for Research into Higher Education and Open University Press.

Balunywa, A., van Diepen, G., Dijkstra, W., Henriquez, K., & White, B. (2009). The Introduction. In G. Lovink (Ed.), *Beyond ICT4D: New Media Research in Uganda* (Vol. 10, pp. 23-25). Amsterdam: Institute of Network Cultures.

Bañados, E. (2006). A Blended-learning Pedagogical Model for Teaching and Learning EFL successfully through an Online Interactive Multimedia Environment. *CALICO Journal, 23*(3), 533-550.

Bannan-Ritland, B. (2002). Literacy access online: The development of an online support environment for literacy facilitators working with children with disabilities. *Tech Trends, 45*(2), 17-22.

Bannan-Ritland, B. (2003). Computer-mediated communication, e-learning, and interactivity. A review of the research. *The Quarlerly Review of Distance Education, 3*(2), 161-179.

Bannan-Ritland, B. (2003). The role of design in research: The integrative learning design framework. *Education Researcher, 32*(1), 21 - 24.

Barnes, K., Marateo, R. C., & Ferris, P. S. (2007). Teaching and learning with the net generation. *Innovate, 3*(4).

Retrieved August 8, 2013, from http://www.innovateonline.info/index.php?view=article&id=382

Baumann, J. F., Dillion, D. R., Shockley, B. B., Alvermann, D. E., & Reinking, D. (1996). Perspective in literacy research. In L. Baker, P. P. Afflerbach, & D. Reinking (Eds.), *Developing Engaged Readers in School and Home Communities* (pp. 217-245). Hillsdale, NJ: Erlbaum.

Baumann, J. F., Ware, D., & Edwards, E. C. (2007). "Bumping into spicy, tasty words that catch your tongue": A formative experiment on vocabulary instruction. *The Reading Teacher, 61*(2), 108-122.

Bax, S. (2003). CALL - past, present and future. *System, 31*(1), 13-28.

Beck, C. T. (2003). Initiation into qualitative data analysis. *Journal of Nursing Education, 42*(5), 231-234.

Beetham, H., & Sharpe, R. (2007). An introduction to rethinking pedagogy for a digital age. In H. Beetham, & R. Sharpe (Eds.), *Rethinking Pedagogy for a Digital Age: Designing and Delivering E-learning* (1st ed., pp. 1-10). Abingdon: Routledge.

Benesch, S. (2001). *Critical English for Academic Purposes: Theory, Politics, and Practice.* Mahwah, New Jersey: Lawrence Erlbaum Associates, Inc.

Biesenbach-Lucas, S. (2004). Asynchronous web discussions in teacher training courses: Promoting collaborative learning - or not? *AACE Journal, 12*(2), 155-170.

Biggs, J. (2003). *Teaching for quality learning at university: What the student does* (2nd ed.). Buckingham: SRHE and Open University Press.

Blaike, N. (2010). *Designing social research.* Cambridge: Polity Press.

Blumenfeld, P. C., Kempler, T. M., & Krajcik, J. S. (2006). Motivation and cognitive engagement in learning environments. In R. K. Sawyer (Ed.), *The Cambridge Handbook of the Learning Sciences* (pp. 475-488). New York: Cambridge University Press.

Boateng, K., & Ofori-Sarpong, E. (2002). *An Analytical Study of the Labour Market for Tertiary Graduates in Ghana.* Accra: A World Bank/National Council for Tertiary Education and National Accreditation Board.

Bogdan, R. G., & Biklen, S. K. (1992). *Qualitative Research for Education.* Boston, MA: Allyn & Bacon.

Bonamici, A., Hutto, D., Smith, D., & Ward, J. (2005). The "Net Generation": Implications for libraries and higher education. Retrieved August 8, 2013, from http://www.orbiscascade.org/council/c0510/Frye.ppt

Boyle, T., Bradley, C., Chalk, P., Jones, R., & Pickard, P. (2003). Using blended learning to improve student success rates in learning to program. *Journal of Educational Media, 2*(3), 165-178.

Bradley, B. A., & Reinking, D. (2011a). A formative experiment to enhance teacher-child language interactions in a preschool classroom. *Journal of Early Childhood Literacy, 11*(3), 362-401.

Bradley, B. A., & Reinking, D. (2011b). Enhancing research and practice in early childhood through formative and design experiments. *Early Child Development and Care, 181*(3), 305-319.

Bradley, B. A., & Reinking, D. (2011c). Revisiting the connection between research and practice using formative and design experiments. In N. K. Duke, & M. H. Mallette (Eds.), *Literacy Research Methodologies* (2nd ed., pp. 188-212). New York: The Guilford Press.

Braverman, M. T., & Arnold, M. E. (2008). An evaluator's balancing act: Making decisions about methodological rigor. In M. T. Braverman, M. Engle, M. E. Arnold, & R. A. Rennekamp (Eds.), *Program Evaluasion in a Complex Organizational System: Lessons from Cooperative Extension* (Vol. 120, pp. 71-86). New Directions for Evaluation.

Britain, S. (2007). Learning design systems. In H. Beetham, & R. Sharpe (Eds.), *Rethinking Pedagogy for the Digital Age: Designing and Delivering E-learning* (1st ed., pp. 103-114). Abingdon: Routledge.

Brown, A. L. (1992). Design Experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *The Journal of the Learning Sciences, 2*(2), 141 - 178.

Bruen, J., Coyne, C., Eberbach, K., Gallagher, F., Kelly, N., Molloy, R., & O'Neill, D. (2005). *Developing Students' Transferable Skills in the Language Classroom: Case studies from the Transferable Skills in Third Level Modern Languages Curricula Project.* Dublin: Transferable Skills Project.

Bryman, A. (2008). *Social Research Methods* (3rd ed.). Oxford: Oxford University Press.

Butler, Y. G., & Ilno, M. (2005). Current Japanese reforms in English Language Education: The 2003 "Action Plan". *Language Policy, 4*, 25-25.

Calabrese, R., & Faiella, F. (2011). Theoretical and practical issues in designing a blended e-learning course of English as a foreign language. In G. Dettori, & D. Persico (Eds.), *Fostering Self-regulated Learning through ICT* (pp. 162-178). Hershey, PA: IGI Global.

Cannell, C. F., & Kahn, R. L. (1968). Interviewing. In G. Lindzey, & A. Aronson (Eds.), *The Handbook of Social Psychology* (Vol. 2, pp. 526-595). New York: Addison-Wesley.

Chandra, V., & Chandra, R. (2013). An ICT Implementation Strategy for Primary Schools in Fiji. In P.-O. Zander, & M. Georgsen (Eds.), *Changing Education through ICT in Developing Countries* (pp. 129-152). Aalborg: Aalborg University Press.

Chandra, V., & Fisher, D. L. (2009). Students' perceptions of a blended web-based learning environment. *Learning Environments Research, 12*(1), 31-44.

Chapelle, C. (2010). Evaluating Computer Technology for Language Learning. *TESL-Ontario, 36*, 56-67.

Chapelle, C. A. (1998). Multimedia CALL: Lessons to be learned from research on instructed SLA. *Language Learning & Technology, 2*(1), 22-34.

Chapelle, C. A. (2001). *Computer Applications in Second Language Acquisition: Foundations for Teaching, Testing and Research.* Cambridge: Cambridge University Press.

Chapelle, C. A. (2003). *English Language Learning and Technology : Lectures on Applied Linguistics in the Age of Information and Communication Technology.* Amsterdam: John Benjamins Publishing.

Chen, J., Belkada, S., & Okamoto, T. (2004). How a web-based course facilitates acquisition of English for Academic Purposes. *Language Learning & Technology, 8*(2), 33-49.

Chen, Y. S., Kao, T. C., Sheu, J. P., & Chiang, C. Y. (2002). A mobile scaffolding-aid-based bird-watching learning system. *Proceedings of IEEE International Workshop on Wireless and Mobile Technologies in Education (WMTE'02)* (pp. 15-22). Tokushima: IEEE Computer Society Press.

Chickering, A. W., & Gamson, Z. F. (1987). Seven principles for good practice in undergraduate education. *AAHE Bulletin, 39*(7), 3-7.

Clark, W., Logan, K., Luckin, R., Mee, A., & Oliver, M. (2009). Beyond Web 2.0: Mapping the technology landscapes of young learners. *Journal of Computer Assisted Learning, 25*(1), 56-69.

Cobb, P. (2001). Supporting the improvement of learning and teaching in social and institutional context. In S. Carver, & D. Klahr (Eds.), *Cognition and Instruction: Twenty-five Years of Progress* (pp. 455-478). Cambridge, MA: Lawrence Erlbaum Associates.

Cobb, P., Confrey, J., diSessa, A., Lehrer, R., & Schauble, L. (2003). Design experiments in educational research. *Educational Researcher, 32*(1), 9-13.

Cohen, J. (1988). *Statiscal Power Analysis for the Behavioral Sciences* (2nd ed.). Mahwah, New Jersey: Lawrence Erlbaum Associates.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods in Education* (6th ed.). Abingdon: Routledge.

Coker, W., & Abude, F. M. (2012). Referral trends among students of the Communicative Skills course in a Ghanaian university. *English for Specific Purposes World, 36*(12), 1-20.

Collins, A. (1992). Towards a design science of education. In E. Scanlon, & T. O'Shea (Eds.), *New Directions in Educational Technology* (pp. 15-22). Berlin: Springer.

Collins, A. (1999). The changing infrastructure of education research. In E. Lagemann, & L. Shulman (Eds.), *Issues in Education Research* (pp. 289-298). San Francisco: Jossey-Bass.

Collins, A., & Halverson, R. (2009). *Rethinking Education in the Age of Technology: The Digital Revolution and Schooling in America.* New York: Teachers College Record.

Collins, A., Joseph, D., & Bielaczyc, K. (2004). Design Research: Theoretical and methodological issues. *Journal of the Learning Sciences, 13*(1), 15-42.

Conole, G. (2013). *Designing for Learning in an Open World.* New York: Springer.

Conole, G., Oliver, M., Falconer, I., Littlejohn, A., & Harvey, J. (2007). Designing for learning. In G. Conole, & M. Oliver (Eds.), *contemporary Perspectives in E-learning: Themes, Methods and Impact on Practice* (pp. 101-120). Abingdon: Routledge.

Cooper, D. R., & Schindler, P. S. (2006). *Business Research Methods.* New York: McGraw Hill.

Corbel, C., Gruba, P., & Enright, H. (2002). *Taking the Web to Task.* Sydney: National Centre for English Language Teaching and Research.

Creswell, J. W. (2010). Mapping the developing landscape of mixed methods research. In A. Tashakkori, & C. Teddlie (Eds.), *The SAGE Handbook of Mixed Methods in Social & Behavioral Research* (2nd ed., pp. 45-68). Thousand Oaks, CA: SAGE Publications.

Creswell, J. W. (2012). *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research* (4th ed.). Boston, MA: Pearson Education, Inc.

Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and Conducting Mixed Methods Research* (2nd ed.). Thousand Oaks, CA: SAGE Publications.

Cuban, L. (2001). *Oversold and Underused.* Cambridge: Harvard University Press.

Darkwa, O., & Mazibuko, F. (2000). Creating virtual learning communities in Africa: challenges and prospects. *First Monday, 5*(5). Retrieved from http://www.firstmonday.dk/issue/issue5_5/darkwa/

Davidsen, J., & Georgsen, M. (2010). ICT as a tool for collaboration in the classroom - challenges and lessons learned. *Designs for Learning, 3*(1-2), 54-69.

Day, E., & Sharpson, S. (2001). Integrating formal and functional approaches to language teaching in French immersion: An experimental study. *Language Learning, 51*(1), 47-80.

DBRC. (2003). Design-Based Research: An Emerging Paradigm for Educational Inquiry. *Educational Researcher, 32*(1), 5 - 8.

De Corte, E., Verschaffel, L., & Van de Ven, A. (2001). Improving text comprehension strategies in upper primary school children: A design experiment. *British Journal of Psychology, 71*(4), 531-559.

De Freitas, S., & Conole, G. (2010). The influence of pervasive and integrative tools on learners experiences and expectations of study. In R. Sharpe, H. Beetham, & S. De Freitas (Eds.), *Rethinking Learning for a Digital Age: How Learners are Shaping their own Experiences* (pp. 15-30). New York: Routledge.

Debski, R. (2000). Project-oriented CALL: implementation and evaluation. *Computer Assisted Language Learning, 13*(4-5), special edition.

Dede, C. (2004). If design-based research is the answer, what is the question? A commentary on Collins, Joseph and Bielaczyc: diSessa and Cobb: and Fishman, Marx, Blumenthal, Krajcik, and Soloway in the JLS Special Issue on Design-Based Research. *The Journal of the Learning Sciences, 13*(1), 105-114.

Denscombe, M. (2007). *The Good Reseach Guide for Small-scale Social Research Projects* (3rd ed.). Maidenhead, Berkshire: Open University Press.

Dillion, D. R., O'Brien, D. G., & Heilman, E. E. (2000). Literacy Research in the next millennium: From paradigms to pragmatism and practicality. *Reading Research Quarterly, 35*(1), 10-26.

Dillion, G. (1991). *Contending Rhetorics: Writing in Academic Disciplines*. Bloomingdale: Indiana University Press.

Dirckinck-Holmfeld, L., Nielsen, J., Fibiger, B., Danielsen, O., Riis, M., Sorensen, E. K., . . . Ritterbusch, W. (2009). Problemand Project Based Networked Learning: The MIL Case. In L. Dirckinck-Holmfeld, C. Jones, & B. Lindstrom (Eds.), *Analysing Networked Learning Practices in Higher Education and Continuing Professional Development* (pp. 155-174). Rotterdam: Sense Publishers.

Dix, K. L. (2007). DBRIEF: A research paradigm for ICT adoption. *International Education Journal, 8*(2), 113-124.

Doughty, C., & Long, M. (2003). Optimal psycholinguistic environments for distance foreign language learning. *Language Learning and Technology, 7*(3), 50-80.

Driscoll, D. L., Appiah-Yeboah, A., Salib, P., & Rupert, D. J. (2007). Merging Qualitative and Quantitative Data in Mixed Methods Research: How To and Why Not. *Ecological and Environmental Anthropology, 3*(1), 19-28.

Driscoll, M. (2002). Blended learning: Let's get beyond the hype. *E-Learning, 3*(3), 54.

Edelson, D. C. (2002). Design research: What we learn when we engage in design. *Journal of the Learning Sciences, 11*(1), 105-121.

Ellis, R. (1999). Theoretical perspectives on interaction and language learning. In R. Ellis (Ed.), *Learning a second language through interaction* (pp. 3-31). Amsterdam: John Benjamins.

Englert, C. S., Zhao, Y., Collings, N., & Romig, N. (2005). Learning to read words: The effects of Internet-based software on the improvement of reading performance. *Remedial and Special Education, 26*(6), 357-370.

Feilzer, M. Y. (2010). Doing Mixed Methods Research Pragmatically: Implications for the Rediscovery of Pragmatism as a Research Paradigm. *Journal of Mixed Methods Research, 4*(1), 6–16.

Fenton, A. (2006, April 26). *PRESSURE.TO*. Retrieved October 14, 2011, from Weft QDA: A free qualitative analysis software application: http://www.pressure.to/qda/

Firestone, W. A. (1993). 'Alternative arguments for generalizing from data as applied to qualitative research. *Educational Researcher, 22*(4), 16-23.

Fisher, D., Frey, N., & Lapp, D. (2009). Meeting AYP in a high-need school. *Journal of Adolescent & Adult Literacy, 52*(5), 386-396.

Flowerdew, J., & Peacock, M. (2001). Issues in EAP: A preliminary perspective. In J. Flowerdew, & M. Peacock (Eds.), *Research perspectives on English for academic purposes.* (pp. 8-24). Cambridge: Cambridgee University Press.

Frick, T. W., & Reigeluth, C. M. (1992). Verifying instructional theory through analysis of patterns in time. *Annual Conference of the American Educational Research Association*, (pp. 1-28). San Francisco, CA.

Fulantelli, G. (2009). Blended Learning, System Thinking and Communities of Practice. In L. Dirckinck-Holmfeld, C. Jones, & B. Lindstrom (Eds.), *Analysing Networked Learning Practices in Higher Education and Continuing Professional Development.* (pp. 45-62). Amsterdam: Sense Publishers.

Garrison, D. R., & Vaughan, N. D. (2008). *Blended Learning in Higher Education: Framework, Principles and Guidelines.* San Francisco: Jossey-Bass.

Garrison, D. R., Anderson, T., & Archer, W. (2001). Critical Thinking, Cognitive Presence, and Computer Conferencing in Distance Education. *American Journal of Distance Education, 15*(1), 7-23.

Gibbs, G., & Simpson, C. (2004). Conditions under which assessment supports students' learning. *Learning and Teaching in Higher Education*(1), 3-31.

González-Lloret, M. (2003). Designing task-based CALL to promote interaction: En Busca de Esmeraldas. *Language Learning & Technology, 7*(1), 86-104.

González-Puenyo, I., Gil, C. F., Siso, M. J., & Marco, M. J. (2009). *Teaching Academic and Professional English Online.* Bern: Verlag Peter Lang.

Graham, C. R. (2006). Blended learning systems: Definition, current trends, and future directions. In C. J. Bonk, & C. R. Graham (Eds.), *The Handbook of Blended Learning:Global Perspectives, Local Designs* (pp. 3-21). San Francisco: Pfeiffer.

Graham, C. R., & Allen, S. (2009). Designing blended learning environments. *IGI Global*, 562-570.

Gravemeijer, K., & Cobb, P. (2006). Design research from a learning design perspective. In J. V. den Akker, K. Gravemeijer, S. McKenney, & N. Nieveen (Eds.), *Educational Design Research* (pp. 17-51). Abingdon: Routledge.

Greasley, P. (2008). *Quantitative Data Analysis Using SPSS: An Introduction for Health & Social Science.* Maidenhead: Open University Press, McGraw-Hill Education.

Gruba, P. (2004). Designing tasks for online collaborative language learning. *Prospect, 19*(2), 72-81.

Gruba, P. (2004a). Computer assisted language learning (CALL). In A. Davies, & C. Elder (Eds.), *The Handbook of Applied Linguistics* (pp. 623-648). Malden, MA.: Blackwell Publishing Ltd.

Gruba, P. (2004b). Designing tasks for online collaborative language learning. *Prospect, 19*(2), 72-81.

GSS. (2012). *2010 Population and Housing Census.* Accra: Ghana Statistical Service.

Guri-Rosenblit, S., Sebkoba, H., & Teichler, U. (2007). Massification and diversity of higher education systems: Interplay of complex dimension. *Higher Education Policy, 20*, 373-389.

Hambur, S., Rowe, K., & Luc, L. T. (2002). *Graduate Skills Assessment.* Canberra: Commonwealth of Australia.

Harker, M., & Koutsantoni, D. (2005). Can it be effective? Distance versus blended learning in a web-based EAP programme. *ReCALL, 17*(2), 197-216.

Harris, V. (2003). Adapting blended-based strategy instruction to a distance learning context. *TESL-EJ, 7*(2).

Harvey, L. (2003). *Transitions from higher education to work: A briefing paper presented by Lee Harvey (Centre for Research and Evaluation, Sheffield Hallam University), with advice from ESECT and LTSN Generic Centre colleagues.* Sheffield Hallam University: ESECT and LTSN Generic Centre.

Hawkins, J., & Collins, A. (1992). Design-experiments for infusing technology into learning. *Educational Technology, 32*(9), 63-67.

Heeks, R. (2008). ICT4D 2.0: The next phase of applying ICT for international development. *IEEE Computer Society, 41*(6), 26-33.

Hegelheimer, V., & Chapelle, C. (2000). Methodological issues in research on learner-computer interactions in CALL. *Language Learning & Technology, 4*(1), 41-59.

Heinich, R., Molenda, M., Russell, J. D., & Smaldino, S. E. (2002). *Instructional Media and Technologies for Learning* (7th ed.). New Jersey: Merrill Prentice Hall.

Hémard, D., & Cushion, S. (2001). Evaluation of a web-based language learning environment: the importance of a user-centred design approach for CALL. *ReCALL, 13*(01), 15-31.

Hesse-Biber, S. N. (2010). *Mixed Methods Research: Merging Theory with Practice.* New York: The Guilford Press.

Hoadley, C. M. (2004). Methodological alignment in design-based research. *Educational Psychologist, 39*(4), 203-212.

Hockly, N. (2010, January 6). *Top ten moderator skills (for 2010).* Retrieved July 10, 2013, from E-Moderation Station: http://www.emoderationskills.com/?p=66

Huang, R., & Zhou, Y. (2006). Designing blended learning focused on knowledge category and learning activities: Case studies from Beijing Normal University. In C. J. Bonk, & C. R. Graham (Eds.), *Handbook of Blended Learning: Global Perspective, Local Designs* (1 ed., pp. 296-310). San Francisco: Pfeiffer.

Humphreys, P., Greenan, K., & Mcllveen, H. (1997). Developing work-based transferable skills in a university environment. *Journal of European Industrial Training, 21*(2), 63-69.

Hutchinson, T., & Waters, T. (1987). *English for Specific Purposes: A Learning-Centred Approach.* Cambirdge: Cambridge University Press.

Hyland, K. (2006). *English for Academic Purposes: An Advanced Resource Book.* Abingdon: Routledge.

Hyland, K., & Hamp-Lyons, L. (2002). EAP: Issues and directions. *Journal of English for Academic Purposes, 1*, 1-12.

Ivey, G., & Broaddus, K. (2007). A formative experiment investigating literacy engagement among adolescent Latina/o students just beginning to read, write and speak English. *Reading Research Quarterly, 42*(4), 512-545.

Jaffer, S., Ng'ambi, D., & Czerniewicz, L. (2007). The role of ICTs in higher education in South Africa: one strategy for addressing teaching and learning challenges. *International Journal of Education and Development using ICT, 3*(4).

Jarvis, H. (2001). Internet usage of English for Academic Purposes. *ReCALL, 13*(2), 206-212.

Jarvis, H. (2004). Investigating the classroom application of computers on EFL at Higher Education institutions in UK. *The Journal of English for Academic Purposes, 3*, 111-137.

Jiménez, R. T. (1997). The strategic reading abilities and potential of five low-literacy Latina/o readers in middle school. *Reading Research Quarterly, 32*(3), 224-243.

JISC. (2005). *Study of environments to support e-learning in UK further and higher education: A supporting study for the Joint Information Systems Committee (JISC).* Brighton: Social Informatics Research Unit, University of Brighton. Retrieved November 10, 2012, from http://www.jisc.ac.uk/uploaded_documents/e-learning_survey_2005.pdf

Johns, A. M., & Swales, J. M. (2002). Literacy and Disciplinary Practices: Opening and Closing Perspective. *Journal of English for Academic Purposes, 1*(1), 13-28.

Jones, C., Ramanau, R., Cross, S., & Healing, G. (2010). Net generation or digital natives: Is there a distinct new generation entering university? *Computers & Education, 54*, 722-732.

Jones, N. (2006). E-College Wales, A case study of blended learning. In C. J. Bonk, & C. R. Graham (Eds.), *Handbook of Blended Learning:Global Perspectives, Local Designs.* (pp. 182-194). San Francisco, CA: Pfeiffer Publishing.

Jordan, R. R. (1997). *English for Academic Purposes: A Guide and Resource Book for Teachers.* Cambridge: Cambridge University Press.

Jordan, R. R. (2002). The growth of EAP in Britain. *Journal of English for Academic Purposes, 1*(1), 69-78.

Kanselaar, G., Erkens, G., Andriessen, J., Prangsma, M., Veerman, A., & Jaspers, J. (2003). Designing argumentation tools for collaborative learning. In P. A. Kirschner, S. J. Shum, & C. S. Carr (Eds.), *Visualising Argumentation: Software Tools for Collaborative and Educational Sense-Making* (pp. 51-73). London: Springer-Verlag.

Kawulich, B. B. (2004). Data analysis techniques in qualitative research. *Journal of Research in Education, 14*(1), 96-113.

Kelly, A. E., Lesh, R. A., & Baek, J. Y. (2008). *Handbook of Design Research Methods in Education: Innovations in Science, Technology, Engineering, and Mathematics Learning and Teaching.* New York: Routledge.

Kocoglu, Z., Ozek, Y., & Kesli, Y. (2011). Blended learning: Investigating its potential in an English language teacher training program. *Australasian Journal of Educational Technology, 27*(7), 1124-1134.

Kodom-Gyasi, W., Nartey, T. A., & Coker, W. (2011). A preliminary report on first year university students' knowledge of basic grammar: The case of the University of Cape Coast. *Current Research Journal of Social Sciences, 3*(5), 399-405.

Kol, S., & Schcolnik, M. (2008). Asynchronous forums in EAP: Assessment issues. *Language Learning & Technology, 12*(2), 49-70.

Koper, R. (2006). Current Research in Learning Design. *Educational Technology & Society, 9*(1), 13-22.

Krueger, R. A. (1988). *Focus Groups: A Practical Duide for Applied Science.* Newbury Park, CA: Sage.

Kuh, G. D. (2003). What we're learning about student engagement from NSSE: benchmarks for effective educational practices. *Change: The Magazine of Higher Learning, 35*(2), 24-32.

Kupetz, R., & Ziegenmeyer, B. (2005). Blended learning in a teacher training course: Integrated interactive e-learning and contact learning. *ReCALL, 17*(2), 179-196.

Lai, C., & Gu, M. (2011). Self-regulated out-of-class Language Learning with Technology. *Computer Assisted Language Learning, 24*(4), 317-335.

Lam, A. (2002). English in Education in China: Policy and learners' experiences. *World Englishes, 21*(2), 245-256.

Lapadat, J. C. (2002). Written interaction: A key component in online learning. *Journal of Computer-Mediated Communication, 7*(4).

Laurillard, D. (2002). *Rethinking University Teaching: A Framework for the Effective Use of Learning Technologies* (2nd ed.). Abingdon: RoutledgeFalmer.

Laurillard, D. (2012). *Teaching as a Design Science.* New York: Routledge.

Lea, M. R., & Stierer, B. (2000). *Student Writing in Higher Education: New Contexts.* Buckingham: The Society for Research in Higher Education and Open University Press.

Lefoe, G., & Hedberg, J. G. (2006). Blending on and off campus. In C. J. Bonk, & C. R. Graham (Eds.), *The Handbook of Blended Learning: Global Perspectives, Local Designs* (pp. 325-337). San Francisco: Pfeiffer.

Levy, M. (1997). *Computer-assisted Language Learning: Content and Contextualisation.* Oxford: Oxford University Press.

Levy, M. (2002). CALL by design: discourse, products and processes. *ReCALL, 14*(01), 58-84.

Lewis, T. (2011). Review of Isabel González-Pueyo, Carmen Foz Gil, Mercedes Jaime Siso, and María José Luzón Marco 'Teaching Academic and Professional English Online'. *ReCALL*, 79-82.

Lim, D. H., & Kim, H. (2003). Motivation and learner characteristics affecting online learning and learning application. *Journal of Educational Technology Systems, 31*(4), 423-439.

Lindquist, B. (2006). Blended Learning at the University of Phoenix. In *The Handbook of Blended Learning: Global Perspectives, Local Designs.* (pp. 223-234). San Francisco: Abingdon.

Littlejohn, A., & Pegler, C. (2007). *Preparing for Blended E-learning.* Abingdon: Routledge.

Long, M. H. (1996). The role of linguistic environment in second language acquisition. In W. C. Ritchie, & T. K. Bhatia (Eds.), *Handbook of Research on Language Acquisition: Vol. 2. Second Language Acquisition* (pp. 413-468). New York: Academic Press.

López-Pérez, M. V., Pérez–López, M. C., & Rodríguez-Ariza, L. (2011). Blended learning in higher education: Students' perceptions and their relation to outcomes. *Computers & Education, 56*(3), 818-826.

Macdonald, J. (2008). *Blended Learning and Onlline Tutoring: Planning Learner Support and Activity Design* (2nd ed.). Aldershot: Gower Publishing Limited.

Marco, M. J. (2009). Learning academic and professional English online: Integrating technology, language learning and disciplinary knowledge. In I. Gonzalez-Puenyo, C. F. Gil, M. J. Siso, & M. J. Marco (Eds.), *Teaching Academic and Professional English Online.* Bern: Peter Lang.

Masie, E. (2002). Blended learning: The magic is the mix. In A. Rossett (Ed.), *The ASTD E-learning Handbook* (p. 59). New York: McGraw-Hill.

Mbatia, P. N. (2011). Education and information & communication technologies (ICT) in Africa: Using ICT to improve education in Sub-Saharan Africa. 86-113. Retrieved from http://journals.uonbi.ac.ke/ajs/article/download/944/881.

McKenney, S., & Reeves, T. C. (2012). *Conducting Educational Design Research.* Abingdon, Oxon: Routledge.

McKenney, S., & Voogt, J. (2009). Designing technology for emergent literacy: The PictoPal initiative. *Computers & Education, 52*(4), 719-729.

Merton, R. K., & Kendall, P. L. (1946). The Focused Interview. *American Journal of Sociology, 51*(6), 541-557.

Miniwatts Marketing Group. (2013). Internet World Statistics. Retrieved August 1, 2014, from http://www.internetworldstats.com/stats1.htm

Miyazoe, T., & Anderson, T. (2010). Learning outcomes and students' perceptions of online writing: Simultaneous implementation of forum, blog and wiki in an EFL blended learning setting. *System, 38*, 185-199.

Miyazoe, T., & Anderson, T. (2012). Discuss, reflect and collaborate: A qualitative analysis of forum, blog and wiki use in an EFL blended learning course. *Procedia - Social and Behavioural Sciences, 34*, 146-152.

Mohamedbhai, G. (2008). *The Effects of Massification on Higher Education in Africa.* Accra: Association of African Universities.

Mor, Y., & Craft, B. (2012). Learning design: reflections upon the current landscape. *Research in Learning Technology*, 85-94.

Retrieved from http://www.researchinlearningtechnology.net/index.php/rlt/article/view/19196

Mor, Y., & Winters, N. (2007). Design approaches in technology enhanced learning. *Interactive Learning Environments, 15*(1), 61-75.

Mungra, P. (2009). Online delivery of a writing course: Description of a blended language course integrated into medicine. In I. Gonzalez-Pueyo, C. F. Gil, M. J. Siso, & M. J. Marco (Eds.),

Teaching Academic and Professional English Online (pp. 181-208). Bern: Peter Lang AG, International Academic Publishers.

Murray, D. E. (2005). Technologies for second language literacy. *Annual Review of Applied Linguistics, 25*, 188-201.

Nafukho, F. M. (2007). The place of E-learning in Africa's institutions of higher learning. *Higher Education Policy, 20*, 19-43.

NCTE. (2012). *National Council for Tertiary Education - Norms for Tertiary Education (Universities)*. Accra: National Council for Tertiary Education.

Nesi, H. (1998). Using the Internet to teach English for academic purposes. *ReCALL, 10*(1), 109-117.

Newman, D. (1990). Opportunities for research on the organizational impact of school computers. *Educational Researcher, 19*(3), 8-13.

Nicol, D., & Boyle, J. (2003). Peer instruction versus class-wide discussion in large classes: a comparison of two interaction methods in the wired classroom. *Studies in Higher Education, 28*(4), 457-473.

Nunan, D. (2004). *Task-Based Language Learning.* Cambridge: Cambridge University Press.

Oakey, D. (1999). An EAP module via the Merlin Internet Learning Environment. In B. Morrison, D. Cruikshank, D. Gardner, J. James, & K. Keobke (Eds.), *Information Technology & Multimedia in English Language Teaching.* Hong Kong: English Language Centre: Hong Kong Polytechnic University.

Oblinger, D., & Oblinger, J. L. (2005). *Educating the Net Generation.* An Educause e-book publication. Retrieved August 8, 2013

Ogata, H., & Yano, Y. (2004). Knowledge awareness map for computer-supported ubiquitous language-learning. *The 2nd IEEE International Workshop on Wireless and Mobile Technologies in Education* (pp. 19-26). Taoyuan, Taiwan: IEEE.

Orey, M. (2002). One year of online blended Learning: Lessons learned. *Annual Meeting of the Eastern Educational Research Association.* Sarasota, FL.

Osguthorpe, R. T., & Graham, C. R. (2003). Blended learning environments: Definitions and directions. *The Quarterly Review of Distance Education, 4*(3), 227-233.

Owu-Ewie, C. (2006). The language policy of education in Ghana: A critical look at the English-only language policy of education. In J. Mugane (Ed.), *Selected proceedings of the 35th Annual Conference on African Linguistics* (pp. 76-85). Somerville, MA: Cascadilla Proceedings Project.

Pallant, J. (2005). *SPSS Survival Manual:A step by step guide to data analysis using SPSS for Windows (Version 12)*. Crows Nest NSW: Allen & Unwin.

Palloff, R. M., & Pratt, K. (2005). *Collaborative online larning together in community*. San Francisco: Jossey-Bass.

Pastor, M. L. (2009). Enhancing learner-teacher collaboration through the use of online activities. In I. Gonzalez-Pueyo, C. F. Gil, M. J. Siso, & M. J. Marco (Eds.), *Teaching Academic and Professional English Online* (pp. 107-126). Bern: Peter Lang AG, International Academic Publishers.

Patton, M. Q. (2002). *Qualitative Research and Evaluation Methods* (3rd ed.). Thousand Oaks, CA: SAGE Publications.

Pelgrum, W. J. (2001). Obstacle to the Integration of ICT in Education: Results from a Worldwide Educational Assessment. *Computers & Education, 37*, 163-178.

Peters, O. (2001). *Learning and Teaching in Distance Education: Analyses and Interpretations from an International Perspective*. London: Kogan Page.

PHEA. (2007). *ICTs and Higher Education in Africa*. Cape Town: Centre of Educational Technology, University of Cape Town.

Plews, M. (2010). *A Review of current best-practice in EAP and how its effectiveness can be measured*. Sheffield: Sheffield Hallam University.

Prensky, M. (2001). Digital Natives, Digital Immigrants. *On the Horizon, 9*(5).

Prensky, M. (2003). Digital game-based learning. *ACM Computers in Entertainment, 1*(1), 1-4.

Reeves, T. C. (2000). Enhancing the worth of instructional technology research through "design experiments" and other development research strategies. *International Perspectives on Instructional Technology Research for the 21st Century* (pp. 1-15). New Orleans, LA: American Educational Research Association.

Reeves, T. C. (2006). Design research from a technology perspective. In J. van den Akker, K. Gravemeijer, S. McKenney, & N. Nieveen (Eds.), *Educational Design Research* (pp. 52-66). Abingdon, Oxon: Routledge.

Reigeluth, C. M., & Frick, T. W. (1999). Formative research: A methodology for creating and improving design theories. In C. M. Reigeluth (Ed.), *Instructional design Theories and Models: A New Paradigm of Instructional Theory* (Vol. II, pp. 633-651). Hillsdale, NJ: Lawrence Erlbaum Associates.

Reinking, D. H., & Bradley, B. A. (2008). *On Formative and Design Experiments: Approaches to Language and Literacy Research*. New York: Teachers College Press.

Reinking, D., & Pickle, J. M. (1993). Using a formative experiment to study how computers affect reading and writing in classrooms. In D. J. Leu, & C. K. Kinzer (Ed.), *42nd yearbook of the National Reading Conference* (pp. 263-270). Chicago: National Reading Conference.

Reinking, D., & Watkins, J. (2000). A formative experiment investigating the use of multimedia book reviews to increase elementary students' independent reading. *Reading Research Quarterly, 35*(3), 384-419.

Richards, J. C. (2006). *Communicative Language Teaching Today*. Cambridge: Cambridge University Press.

Richey, R. C., & Nelson, W. A. (1996). Developmental research. In D. Jonassen (Ed.), *Handbook for Research for Educational Communications and Technology* (pp. 1213-1245). London: Macmillan.

Richey, R. C., Klein, J. D., & Nelson, W. A. (2003). Development research: Studies of instructional design and development. In D. H. Jonassen (Ed.), *Handbook of Research for Educational Communications and Technology* (pp. 1099-1130). Mahwah, NJ: Lawrence Erlbaum Associates.

Robson, C. (2002). *Real World Research* (2nd ed.). Oxford: Blackwell.

Ruiz-Garrido, M. F., Palmer-Silveira, J. C., & Fortanet-Gómez, I. (2010). Current trends in English for professional and academic purposes. In M. F. Ruiz-Garrido, J. C. Palmer-Silveira, & I. Fortanet-Gómez (Eds.), *English for Professional and Academic Purposes* (pp. 1-10). Amsterdam: Rodopi.

Ryberg, T., & Dirckinck-Holmfeld, L. (2010). Analysing digital literacy in action: A case study of a problem-oriented learning process. In R. Sharpe, H. Beetham, & S. De Frietas (Eds.), *Rethinking Learning for a Digital Age: How Learners are Shaping their own Experiences* (pp. 170 - 183). Abingdon: Routledge.

Salmon, G. (2004). *E-moderating: The Key to Teaching and Learning Online* (2 ed.). London: RoutledgeFalmer.

Sampson, N. (2003). Meeting the needs of distance learners. *Language Learning & Technology, 7*(3), 103-118.

Samraj, B. (2002). Texts and Contextual Layers: Academic Writing in Content Courses. In A. Johns (Ed.), *Genre in the Classroom: Multiple Perspectives*. (pp. 163-176). Marwah, New Jersey: Lawrence Erlbaum Associates Publishers.

Sarfo, F. K., & Ansong-Gyimah, K. (2010). The Perceptions of Students, Teachers and Educational Officers in Ghana on the Role of Computer and the Teacher in Promoting the First Five Principles of Instruction. *The Turkish Online Journal of Educational Technology, 9*(3), 85-95.

Sarkar, S. (2012). The role of information and communication technology (ICT) in higher education for the 21st century. *The Science Probe, 1*(1), 30-41.

Sayago, S., Sloan, D., & Blat, J. (2011). Everyday use of computer-mediated communication tools and its evolution over time : an ethnographical study with older people. *Interacting with Computers, 23*(5), 543-554.

Seargeant, P., & Erling, E. J. (2011). The discourse of 'English as a language for international development: Policy assumptions and practical challenges. In H. Coleman (Ed.), *Dreams and Realities: Developing Countries and the English Language* (pp. 248-268). London, UK: British Council. Retrieved November 27, 2012, from http://www.teachingenglish.org.uk/sites/teacheng/files/Z413%20English%20Development%20Book.pdf

Sharpe, R., & Oliver, M. (2007). Designing courses for e-learning. In H. Beetham, & R. Sharpe (Eds.), *Rethinking Pedagogy forr a Digital Age: Designing and Delivering E-learning* (1st ed., pp. 41-51). Abingdon: Routledge.

Sharpe, R., Benfield, G., Roberts, G., & Francis, R. (2006). *The Undergraduate Experience of Blended E-learning: A Review of UK Literature and Practice.* York: The Higher Education Academy.

Singh, H., & Reed, C. (2001). *A White Paper: Achieving Success with Blended Learning.* Centra Software.

Singhal, M. (1997). The Internet and foreign language education: Benefits and challenges. *The Internet TESL Journal.*

Smidt, E., & Hegelheimer, V. (2004). Effects of online academic lectures on ESL listening comprehension, incidental vocabulary acquisition, and strategy use. *Computer Assisted Language Learning, 17*(5), 517-556.

Sotillo, S. M. (2000). Discourse functions and syntactic complexity in synchronous and synchronous communication. *Language Learning & Technology, 4*(1), 82-119.

Souter, D., Adam, L., Butcher, N., Sibthorpe, C., & Tusubira, T. (2012). Education. In E. Yonazi, T. Kelly, N. Halewood, & C. Blackman (Eds.), *The Transformational Use of Information and Communication Technologies in Africa* (pp. 70-85). New York: World Bank; African Development Bank. Retrieved August 3, 2014, from http://www.eTransformAfrica.org

Spradley, J. P. (1980). *Participant Observation.* New York: Holt, Rinehart & Winston.

Stapleton, P. (2003). Assessing the quality and bias of web-based sources: implications for academic writing. *Journal of English for Academic Purposes, 2*(3), 229-245.

Stepanyan, K., Littlejohn, A., & Margaryan, A. (2013). Sustainable e-learning: Towards a coherent body of knowledge. *Educational Technology & Society, 16*(2), 91-102.

Stracke, E. (2007). A road to understanding: A qualitative study into why learners drop out of a blended language learning (BLL) environment. *ReCALL, 19*(1), 57-78.

Strambi, A., & Bouvet, E. (2003). Flexibility and interaction at a distance: A mixed-mode environment for language learning. *Language Learning & Technology, 7*(3), 81-102.

Swan, K. (2003). Learning effectiveness: What the research tells us. In J. Bourne, & J. C. Moore (Eds.), *Elements of Quality Online Education, Practice and Direction* (pp. 13-45). Needham, MA: Sloan Center for Online Education.

Tagoe, M. (2009). The Relevance of University Education and Fears of Unemployment: Perceptions of University Students Making Transitions to the World of Work in Ghana. In R. Brooks (Ed.), *Transitions from Education to Work: New Perspectives from Europe and Beyond.* (pp. 113-135). Hampshire: Palgrave Macmillan.

Talay-Ongan, A. (2003). Online teaching as reflective tool in constructive alignment. In P. L. Jeffrey (Ed.), *International Education Research Conference AARE-NZARE; 30 November - 3 December 2003* (pp. 1-10). Auckland: Australian Association for Research in Education.

Tapscott, D. (2008). *Grown up Digital: How the Net Generation is Changing your World.* New York: McGraw-Hill.

Toyama, A. (2003). *Ministry of Education, Culture, Sports, Science and Technology, Press Release.* Retrieved November 28, 2012, from http://www.mext.go.jp/english/topics/03072801.htm

Tracy, K. N. (2009). A formative experiment investigating the use of non-fiction texts in writing workshop to assist fourth-grade readers and writers. *An Unpublished Dissertation*. Graduate School of Clemson University.

Trinder, R. (2009). The potential of blended learning environments in terms of beneficial language learning conditions. In I. Gonzalez-Pueyo, C. F. Gil, M. J. Siso, & M. J. Marco (Eds.), *Teaching Academic and Professional English Online* (pp. 35-56). Bern: Peter Lang AG, International Academic Publishers.

UEW. (2010). University of Education, Winneba - University Research Policy. Winneba: University of Education, Winneba.

Umbach, P. D., & Wawrzynski, M. R. (2005). The role of college faculty in student learning and engagement. *Research in Higher Education, 46*(2), 153-184.

Unwin, T. (2009). Introduction to ICT4D. In T. Unwin (Ed.), *ICT4D - Information and Communications Technology for Development* (pp. 1-6). Cambridge: Cambridge University Press.

USAID. (2014). *African Higher Education: Opportunities for Transformative Change for Sustainable Development.* Washington D.C.: Knowledge Centre on Higher Education for African Development.

van den Akker, J. (1999). Principles and methods of development research. In J. van den Akker, N. Nieveen, R. M. Branch, K. L. Gustafson, & T. Plomp (Eds.), *Design Methodology and Developmental Research in Education and Training* (pp. 1 - 14). The Netherlands: Kluwer Academic Publishers.

van den Akker, J., Gravemeijer, K., McKenney, S., & Nieveen, N. (2006). *Educational Design Research.* Abingdon: Routledge.

Vaughan, N., & Garrison, D. R. (2005). Creating cognitive presence in a blended faculty development community. *The Internet and Higher Education*(8), 1-12.

Visser, J. (n.d). Rethinking learning: implications for policy, research and practice. 1-9. Retrieved August 15, 2013, from http://www.learndev.org/dl/RethinkingLearning.PDF

Vygotsky, L. S. (1986). *Thought and Language.* (A. Kozulin, Ed., & A. Kozulin, Trans.) Cambridge: MIT Press.

WAEC. (2011). Final Marking Scheme for English Language 1. Accra, Ghana: West African Examination Council.

Walker, D. F. (1992). Methodological issues in curriculum research. In P. Jackson (Ed.), *Handbook of research on curriculum* (pp. 98-118). New York: Macmillan.

Wang, F., & Hannafin, M. J. (2005). Design-based research and technology-enhanced learning environments. *Educational Technology Research & Development, 53*(4), 5-23.

Warschauer, M., & Healy, D. (1998). Computers and language learning: An overview. *Language Teaching, 31*, 57-71.

Warschauer, M., & Kern, R. (2000). *Network-based language teaching: concepts and practice.* Cambridge: Cambridge University Press.

Wilson, B. (1995). Metaphors for instruction: Why we talk about learning environments. *Educational Technology, 35*(5), 25-30.

Windeatt, S., Hardisty, D., & Eastment, D. (2000). *The Internet.* Oxford: Oxford University Press.

Yu, N. (2004, January-February). Fresh graduates face unemployment. *China Perspectives, 51*.

Zander, P.-O., & Georgsen, M. (2013). Fundamentals of education and ICT for development. In P.-O. Zander, & G. Marianne (Eds.), *Changing Education through ICT in Developing Countries* (pp. 13-30). Aalborg: Aalborg University Press.

Zhao, Y. (2003). Recent Developments in Technology and Language Learning: A Literature Review and Meta-analysis. *CALICO Journal, 21*(1), 7-28.

Appendices

Appendix A – Focused Interview Guide

Thank you for honouring my invitation

I have met you here today so that we can learn from each other about what is really going on in the CS course at UEW. This is a `"no holds barred" interview. I would like to know what you have observed over the years since you started teaching the CS course, even if it looks bad. I believe that is the only way we are going to learn from each other. Of course, I would also want to know where things are going well, but where they are not going well I would really need to hear that message.

I am video-recording this session so that I can study what you have said, but it goes no farther than this meeting. Anything you say will be held in strict confidence; I would not be telling people outside this meeting of who said what.

1. How long have you been teaching the Communication skills course at the university?
2. What else do you teach?
3. What topics do you teach in your CS class?
4. What skills do you think students need to cope with the contents in this course?
5. What do you think are the most important skills that students need to learn from this course for their academic study in this university? For example: Writing? Speaking? Listening and note-taking? Reading? Critical analysis? Presentation skills? Other?
6. What is/are the teaching and learning methods you employ in the CS course?
7. What teaching and learning materials are available for instruction?
8. Are these materials adequate or not?
9. What routines of classroom activities do you employ in the CS course?
10. How often are you able to employ these in a semester?
11. What mode of assessment do you employ in the CS course?
12. What are some things a 'good student' in CS can do that others cannot or do not?
13. What skill(s) do you expect your students to exhibit at the end of the course?
14. How do your students employ the skills you teach them in the other courses you teach in their later academic years at the university?
15. Is there anything else you would like to tell me about your experience with the teaching and learning in the CS course? Thank you very much for your time.

Appendix B - Students' Basic ICT Questionnaire

THANK YOU FOR PARTICIPATING IN THIS STUDY

The primary goal of this study is to determine students' knowledge and skills in the use and application of ICT.

To participate in this study, please fill out the attached questionnaire.

CONFIDENTIALITY

Any personal information resulting from this research study would be kept strictly confidential. Participants would not be identified by name in any report of the completed study. Your participation in this study is entirely voluntary. However, if the questionnaire is completed, your consent is assumed.

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Information and Communication Technology (ICT) Questionnaire

The following questions ask about computers: Computers here include smart phones, I phones, palm tops, etc, but does not include calculators or games consoles like a Sony PlayStation.

Q1 Is there a computer available for you to use at any of these places?

Please, tick one box on each row

	YES	NO
a. At home	☐	☐
b. At School	☐	☐
c. At other places	☐	☐

Q2. Have you ever used a computer?

YES	NO
☐	☐

Q3. How long have you been using computers?

Less than one year	☐
One to three years	☐
Three to five years	☐
More than five years	☐

Q4. How often do you use a computer at these places?

Please tick one box on each row	Almost every day	A few times every week	Between once a week and once a month	Less than once a month	Never
a. At home	☐	☐	☐	☐	☐
b. At school	☐	☐	☐	☐	☐
c. At other places	☐	☐	☐	☐	☐

Q5. How often do you use:

Please tick one box on each row	Almost every day	A few times every week	Between once a week and once a month	Less than once a month	Never
a. The Internet to look up information about people, things or ideas?	☐	☐	☐	☐	☐
b. Games on a Computer?	☐	☐	☐	☐	☐
c. Word processing application?	☐	☐	☐	☐	☐
d. The Internet to collaborate with a group or your course mate?	☐	☐	☐	☐	☐
e. Spreadsheet application?	☐	☐	☐	☐	☐
f. The Internet to download software (including games)?	☐	☐	☐	☐	☐
g. Drawing, painting or graphics programs on a computer?	☐	☐	☐	☐	☐
h. Educational software such as IT programs?	☐	☐	☐	☐	☐
i. The computer to help you learn school material?	☐	☐	☐	☐	☐
j. The Internet to download music, pictures or video?	☐	☐	☐	☐	☐
k. The computer for programming?	☐	☐	☐	☐	☐
l. A computer for electronic communication (e.g. e-mail or chat rooms)?	☐	☐	☐	☐	☐

Q6. How well can you do each of these task on a computer?

Please tick one box on each row	I can do this very well by myself	I can do this with help from some one	I know what this means but I cannot do it	I don't know what this means
a. Start a computer game	☐	☐	☐	☐
b. Use Software to find and get rid of computer viruses	☐	☐	☐	☐
c. Open a file	☐	☐	☐	☐
d. Create/ edit a document	☐	☐	☐	☐
e. Scroll a document up and down a screen	☐	☐	☐	☐
f. Use a database to produce a list of addresses	☐	☐	☐	☐
g. Copy a file from a drive	☐	☐	☐	☐
h. Save a computer document or file	☐	☐	☐	☐
i. Print a computer document or file	☐	☐	☐	☐
j. Delete a computer document or file	☐	☐	☐	☐
k. Move files from one place to another on a computer	☐	☐	☐	☐
l. Get on to the Internet	☐	☐	☐	☐
m. Copy or download files from the Internet	☐	☐	☐	☐
n. Attach a file to an e-mail message	☐	☐	☐	☐
o. Create a computer program (e.g. in Basic, java, etc	☐	☐	☐	☐
p. Use a spreadsheet to plot a graph	☐	☐	☐	☐
q. Create a presentation (e.g. using PowerPoint	☐	☐	☐	☐
r. Play computer games	☐	☐	☐	☐
s. Download music, pictures, or movie from the Internet	☐	☐	☐	☐
t. Create a multi-media presentation (with sound, pictures, video, etc)	☐	☐	☐	☐
u. Draw pictures using a mouse	☐	☐	☐	☐
v. Write and send e-mails	☐	☐	☐	☐
w. Construct a Web page	☐	☐	☐	☐

Q7. Thinking about your experience with computers: To what extent do you agree with the following statements?

Please tick one box on each row	Strongly Agree	Agree	Disagree	Strongly Disagree
a. It is very important to me to work with a computer.	☐	☐	☐	☐
b. I think playing or working with a computer is really fun.	☐	☐	☐	☐
c. I use a computer because I am very interested.	☐	☐	☐	☐
d. I lose track of time when I am working with the computer.	☐	☐	☐	☐

Q8. Who taught you most about how to use computers?

Please tick only one box

a. My school	☐
b. My friend(s)	☐
c. My family	☐
d. I taught myself	☐
e. Others (please specify)	☐

Q9. Who taught you most about how to use the Internet?

Please tick only one box

a. My school	☐
b. My friend(s)	☐
c. My family	☐
d. I taught myself	☐
e. Others (please specify)	☐
f. I don't know how to use the Internet	☐

Q10. Which of these most popular social networking sites do you subscribe to?

Please tick as many boxes as applied to you

a. Facebook	☐
b. Twitter	☐
c. LinkedIn	☐
d. MySpace	☐
e. Google Plus	☐
f. DeviantArt	☐
g. Live Journal	☐
h. Tagged	☐
i. Orkut	☐
j. CafeMom	☐
k. Ning	☐
l. MeetUp	☐
m. myLife	☐
n. myYearbook	☐
o. Badoo	☐
p. Any other (please specify)	☐

Q11. How often do you visit this/these sites?

Please tick one box	Almost every day	A few times every week	Between once a week and once a month	Less than once a month	Never
	☐	☐	☐	☐	☐

Q12. Which of these most popular search engines do you use?

a. Google	☐
b. Bing	☐
c. Yahoo! Search	☐
d. Ask	☐
e. AOL Search	☐
f. MyWebSearch	☐
g. Lycos	☐
h. Dogpile	☐
i. WebCrawler	☐
j. Info	☐
k. Infospace	☐
l. GoodSearch	☐
m. Search	☐
n. Excite	☐
o. AltaVista	☐
p. Any other (please specify)	☐

Q13. How often do you use this/these sites?

Please tick one box	Almost every day	A few times every week	Between once a week and once a month	Less than once a month	Never
	☐	☐	☐	☐	☐

INFORMATION ABOUT YOURSELF

1. NAME OF STUDENT: .....

2. LEVEL AND PROGRAMME: .....

.....

Please tick the box which applies to you.

3. GENDER: male ☐ female ☐

4. AGE: 18 – 24 ☐ 25 – 30 ☐ 31 – 35 ☐ 36 – 40 ☐ 41 – 45 ☐

46 – 50 ☐ 51 – 55 ☐ 56 – 60 ☐

5. Please indicate your highest level of education

SSSCE/WASSCE ☐

4-yr Post Secondary Teacher's Certificate ☐

3-yr Post Secondary Teacher's Certificate ☐

3-yr Post SSSCE Teacher's Certificate ☐

Holder of Diploma Certificate ☐

HND certificate holder ☐

Any other certificate (please specify) .....

Thank you for your assistance!

Appendix C – Baseline Performance Test

Topic:

Write your contribution for or against the motion: "The money that is spent on the national football teams should be used to fund university education".

Notes/guidelines for the exercise

This paper is designed to test your ability to use English as an effective means of communication in an argumentative situation. This will therefore, test your ability to express yourself clearly and coherently in a manner appropriate to the audience, purpose, topic and situation.

Consequently, any deliberate distortion of the nature of this test shall be penalised. Your piece of writing will be judged based on the following factors:

- Adequacy of treatment of the subject matter
- Originality of approach
- Clarity of your argument
- Balance of thought, and
- Mechanical accuracy (these include, undeniable errors in grammar, punctuation and spelling errors)

Appendix D - Perception of students on the use of ABLECAT

Student Evaluation Form

A Blended Learning Environment for the Development of Students' Communication Skills

Completion of Evaluation Form

Please complete the following questions/ statements to reflect **your opinions as accurately as possible** and to answer the questions to the best of your knowledge. Your information will be kept **strictly confidential**.

General Details

Gender: Male ☐ Female ☐

Section 1: Quality of Content

Please tick the relevant box that corresponds to your choice

1. With regard to the layout and content of the **online materials**, please tick your level of agreement with each statement.					
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
a. The content is arranged in a clear, orderly manner.	☐	☐	☐	☐	☐
b. The content is accurate and up to date	☐	☐	☐	☐	☐
c. The content explains concepts well.	☐	☐	☐	☐	☐
d. The layout design of the site is attractive.	☐	☐	☐	☐	☐
e. The navigation design is user friendly.	☐	☐	☐	☐	☐
f. The instructions for using the site are clear.	☐	☐	☐	☐	☐
g. The feedback/answers on tasks /quizzes are good.	☐	☐	☐	☐	☐
h. The materials present were relevant to my course needs.	☐	☐	☐	☐	☐

Section 2: Quality of Learning

2. Please tick your level of agreement with each of the following statement

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
a. The website was a very useful extra source of information and resources.	☐	☐	☐	☐	☐
b. Discussions on the forum helped me understand the course content better.	☐	☐	☐	☐	☐
c. The website resources enabled me to gain a good understanding of each lecture before attending them	☐	☐	☐	☐	☐
d. The website materials enabled me to revise more efficiently	☐	☐	☐	☐	☐
e. The web materials helped me perform better in assignments.	☐	☐	☐	☐	☐

3. I found the following tools quite helpful to my learning of the course

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
a. Online Notes	☐	☐	☐	☐	☐
b. Interactive Quizzes	☐	☐	☐	☐	☐
c. Online video presentations	☐	☐	☐	☐	☐
d. Forums	☐	☐	☐	☐	☐

Section 3: Quality of Communication

4. Please tick your level of agreement with each of the following statements.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
a. The website has improved the communication I had with the teacher.	☐	☐	☐	☐	☐
b. I felt discussions with my classmates on the forum helped me understand the course content.	☐	☐	☐	☐	☐
c. Do you prefer face-to-face teacher consultation or online discussions? Give your reasons why					

Section 4: Level of Engagement

5. With regard to computer proficiency, please evaluate the following statements.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
a. I felt comfortable using computers at the start of the course.	☐	☐	☐	☐	☐
b. I feel more proficient in using computers after I have worked with the course website.	☐	☐	☐	☐	☐
c. The website materials helped me perform better in exams and assignments.	☐	☐	☐	☐	☐

6. How much time did you spend working on online content? Please tick your usage level

	Less than once a month	Once a month	A few times a month	Once a week	Daily
a. How often did you use the internet for learning before using the course website?	☐	☐	☐	☐	☐
b. How often do you use the internet for learning now?	☐	☐	☐	☐	☐
c. How often do you log onto the course website?	☐	☐	☐	☐	☐

7. I was able to do the following quite often on the course website

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
a. Write and reply to postings on the forum at the course website	☐	☐	☐	☐	☐
b. Start new discussions on the forum at the course website	☐	☐	☐	☐	☐
c. View or download online lecture notes on the course website	☐	☐	☐	☐	☐
d. Do online quizzes	☐	☐	☐	☐	☐
e. View or download course information	☐	☐	☐	☐	☐
f. Refer to latest news on the site	☐	☐	☐	☐	☐

8. Did you attend the orientation on the introduction of the blended learning environment (Communication Skills course website)?	Yes ☐	No ☐

9. If you attended, did you feel the orientation was sufficient to enable you to adequately use the course website?	Yes ☐	No ☐	Don't know ☐

10. If you answered 'no' to the previous question, how much training would you feel confident with?

Section 5: Overall Impressions

11. Do you think that the introduction of blended learning environment and the course website has improved the quality and structure of the course?	Yes ☐	No ☐

12. What were your overall thoughts about the course website – did you enjoy using it, were there advantages or were there things you didn't like about it?

Thank you again for your time spent in completing this questionnaire.

Appendix E – Exit performance Test for the students

Notes: Read the following carefully before you begin the exercise

This paper is designed to test your ability to use English as an effective means of communication in an argumentative situation. This will therefore, test your ability to express yourself clearly and coherently in a manner appropriate to the audience, purpose, topic and situation.

Consequently, any deliberate distortion of the nature of this test shall be penalised. Your piece of writing will be judged based on the following factors:

- Adequacy of treatment of the subject matter
- Originality of approach
- Clarity of your argument
- Balance of thought, and
- Mechanical accuracy (these include, undeniable errors in grammar, punctuation and spelling errors)

Topic:

You are a speaker in an Inter-Hall debate motioned "Secondary school education should be free in Ghana". As the main speaker, write your contribution for or against the motion.

Appendix F: A sample of the CS course outline

UNIVERSITY OF EDUCATION, WINNEBA

College of Technology Education - Kumasi

CENTRE FOR INTERDISCIPLINARY STUDIES

COURSE OUTLINE

COURSE TITLE: **Communication Skills (Semester 2)**
COURSE CODE: **COS/CSP 121**
CREDIT HOURS: ***2***

COURSE DESCRIPTION

This course is designed to build on the experience of course Communications skills I. The aim of the course is first to assist students to apply the skills already acquired from the first semester course so that they will be able to develop writing skills and ultimately to help students to identify relationship between comprehension, summary and essay writing and respond to them appropriately for their academic and professional endeavours.

COURSE OBJECTIVES

By the end of the course students should be able to:

- Identify features of a good paragraph
- Write well-developed paragraphs
- Identify the features of a good essay
- Use transitional markers effectively in writing paragraphs/essays
- Write well organized essays
- Extract pieces of information from given passages.
- Write acceptable answers for both comprehension and summary questions

COURSE CONTENT

- The writing Process:- Pre-writing, writing, post writing stages
- Paragraph Features:- Unity, Coherence, linking expressions introduction, conclusion.
- Paragraph Types:- Loose/Direct, Mixed/Pivot, Periodic/suspended, Emphatic, Implied
- Analyzing Essay Questions or topics
- Letter Narrative Writing and Argumentative essays – formal features
- Expository, and Descriptive essays – formal features
- Documentation:- APA house style
- Comprehension:- Reading skills, analyzing questions strategies of answering questions
- Summary Writing:- Reading skills, analyzing questions strategies of answering summary questions.

INSTRUCTIONAL STRATEGIES

Lessons will be presented through lectures and class discussions.

MODE OF ASSESSMENT

There will be continuous assessment and End of Semester Examination.

Continuous Assessment

- Students will be expected to write at least two assignments/tests/quizzes.
- This will cover forty (40) marks.

End of Semester Examination

- Students will be expected to write an examination at the end of the semester. This takes sixty(60)marks.

PASS MARK

To qualify for a pass mark a student is expected to score at least 50% in the continuous assessment and end of semester examination.

READING LIST/REFERENCES

Appiah F. B. (2007) Comprehension and Summary for Practice, (With Tit-bits in Literary Devices). Kumasi. Wilas Press

Howe, A. (1986): How to Study: A Guide to Effective Learning Skills. London Page Ltd.

Markel, M. H. (1984): Technical Writing: Situation and Strategies. USA St. Martin's Press, Inc.

Opoku-Agyeman, N. J. (1998): A Handbook for Writing Skills. Accra Ghana Universities Press.

Taylor, M. E. (2004): A Guide to Comprehension & Summary Writing. Kumasi. UGC Publishing House.

Williams, R. (1982): Panorama: An Advanced Course of English for Study and Examinations, London.